TELEMETRY ON-LINE MONITORING, COMPRESSION, AND TRANSMISSION SYSTEM FOR THE MANNED SPACE FLIGHT NETWORK (TOMCAT)

VOLUME 5

TOMCAT-II - 2KB DATA TRANSMISSION PROGRAM

Prepared
by

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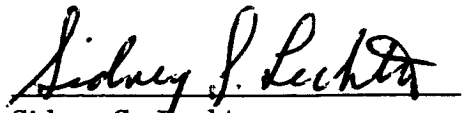

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FOREWORD

This report describes the TOMCAT-II Systems Programs TOMCAT-II A, which was used for systems evaluation and testing and for the GT-2 and GT-3 missions, and TOMCAT-II B, which will be used for future Gemini missions. It contains detail flows and descriptive write-ups of all aspects of both programs. Appendices are included which contain a complete description of the input and output data configurations, and side-by-side assembler listings of the actual coding.

The TOMCAT-II B program remains in a fluid state, so as to be able to incorporate future requirements as they are requested. The present report documents the program as it existed on April 1, 1965. Several changes are already planned to implement additional requirements for GT-4, but these changes are of an incidental nature and the philosophy presented herein will continue to be observed in later editions.

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TELEMETRY ON-LINE MONITORING, COMPRESSION, AND TRANSMISSION SYSTEM FOR THE MANNED SPACE FLIGHT NETWORK (TOMCAT)

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GENERAL INTRODUCTION

The TOMCAT-II series of computer programs is designed to throughput preselected telemetry data directly from remote-site PCM stations to MSCC over a 2000 bits-per-second (2 KBS) telephone line. It does this by selecting from an incoming data stream only those parameters specified by a list stored in the computer memory, and arranging them in a preassigned sequence in a buffer. The buffer is then read out in a continuous cycle at a 2 KBS rate by the Data Transmission Unit (DTU), with all parameters being constantly updated at varying rates as new values arrive in the incoming data stream.

There are presently two models of the TOMCAT-II program in existence. TOMCAT-II A, the original experimental model, was constructed to prove the feasibility of the design concept, and to provide a program which could be used for system evaluation and testing. It has limited flexibility, and is presented here only in skeletal detail, to provide a record of the program evolution. The second-generation program, TOMCAT-II B, has had considerably more versatility designed into it, being able to handle many different kinds of data and to switch itself in and out of many different modes of operation without manual intervention. This B program is slated to be used in the system after GT-3.

SIMPLIFIED TOMCAT-II DESCRIPTION

The Remote Site Data Processor (RSDP) system has been described in some detail in earlier volumes (1, 2, 3). The TOMCAT-II 2 K program input and output data trains have also been discussed previously, (volume 3), and some further details are presented later in this report. The program itself operates in the following manner. In the computer memory are located three buffer areas, two for input and one for output. As the data stream enters the computer, it is diverted first to one, then to the other input buffer, filling them up alternately. In the meantime, while one buffer is filling up, the previously filled alternate

buffer is being selectively transferred to the output buffer. This transfer occurs under control of a table stored in the computer memory, which specifies exactly which parameters of that particular buffer are to be selected, and exactly where they are to be stored in the output buffer area. This process goes on continuously, so that as new data comes in, the selected parameters are immediately put in their proper locations in the output buffer, replacing the old parameters there, and thus keeping the output data up to date. While all this is going on, the output buffer is being unloaded in a continuous cycle by the DTU, so that new data is constantly being transmitted at the 2 KBS operating rate of the DTU.

TOMCAT-II A

The first-generation program, TOMCAT-II A, operates in the general manner described above. It can process only Gemini Real-Time data in either the Live or Tape Playback mode.

Brief TOMCAT-II A Program Description

The computer operator loads and starts the program according to the following instructions:

TOMCAT-II A
Operating Instructions

1. Check that the PCM and DTU are in a POWER ON condition.
2. Load UPAK-IA or UPAK-IB at 20000.
3. Using the UPAK, store the constant "000000" (zero) throughout memory.
4. Using the UPAK, load TOMCAT-II A tape and verify.
5. Place the internal SYNC switches on the computer control panel at INT and ON.
6. Turn off all Stop and Skip Keys.
7. Master clear.
8. Set SKIP KEY 4 if the data are to be playback from the tape recorder; otherwise (if data are to be real-time telemetry) turn SKIP KEY 4 off. See Note 2.

9. If the input to the computer is to be on a channel other than Channel 7, set $(AL)_{2-0}$ to the input channel number. If the output from the computer is to be on a channel other than Channel 5, set $(AU)_{2-0}$ to the output channel number.

10. Set P = 5000.

11. Start. The program will begin operation. See Note 1.

12. At LOS, or at any other time the operator wishes to cease program operation and bring the computer to an orderly halt, turn SKIP KEY ∅ on and off. See Note 3.

Notes

1. The program may be reinitialized at any time by returning to Step 6.

2. Skip Key 4 may be set or cleared as required without halting program operation.

3. When the program senses Skip Key ∅ turned on and off, it sends one last output buffer of data and labels it to notify the receiver it is about to cease sending, and comes to a Stop 5 with AU = output channel number, AL = input channel number, and P = 5000. To restart, simply depress start switch.

The program starts (Steps 10 and 11 of the Operating Instructions) at the initialization routine BEGIN 1. This routine sets up the computer for initial program operation. This includes setting up the computer to input data from the PCM on Channel 7, and to output to the DTU on Channel 5, unless AU and AL are initially set to other values (Step 9 of the Operating Instructions). In addition, BEGIN 1 sets up the interrupt registers, the input and output buffer areas, and sets initial values for some of the program parameters. Finally it turns on the DTU and enables interrupts.

From here control passes to the Executive Routine (EXEC 1), which has the primary responsibility for program operation. The Executive loses program control only when an interrupt occurs. There are four of these interrupts.

TOMCAT - IIA
Executive Routine

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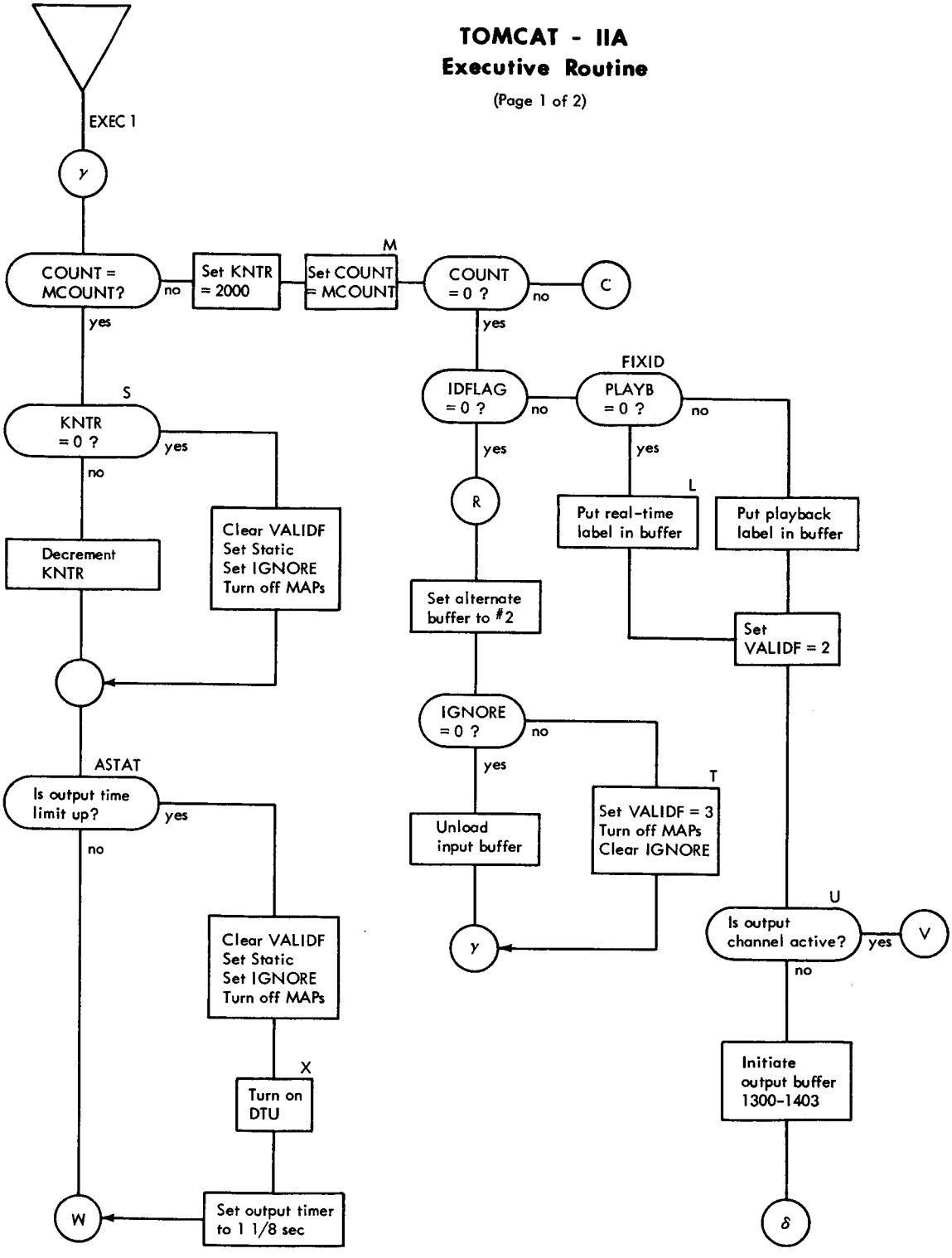

TOMCAT - IIA

Executive Routine

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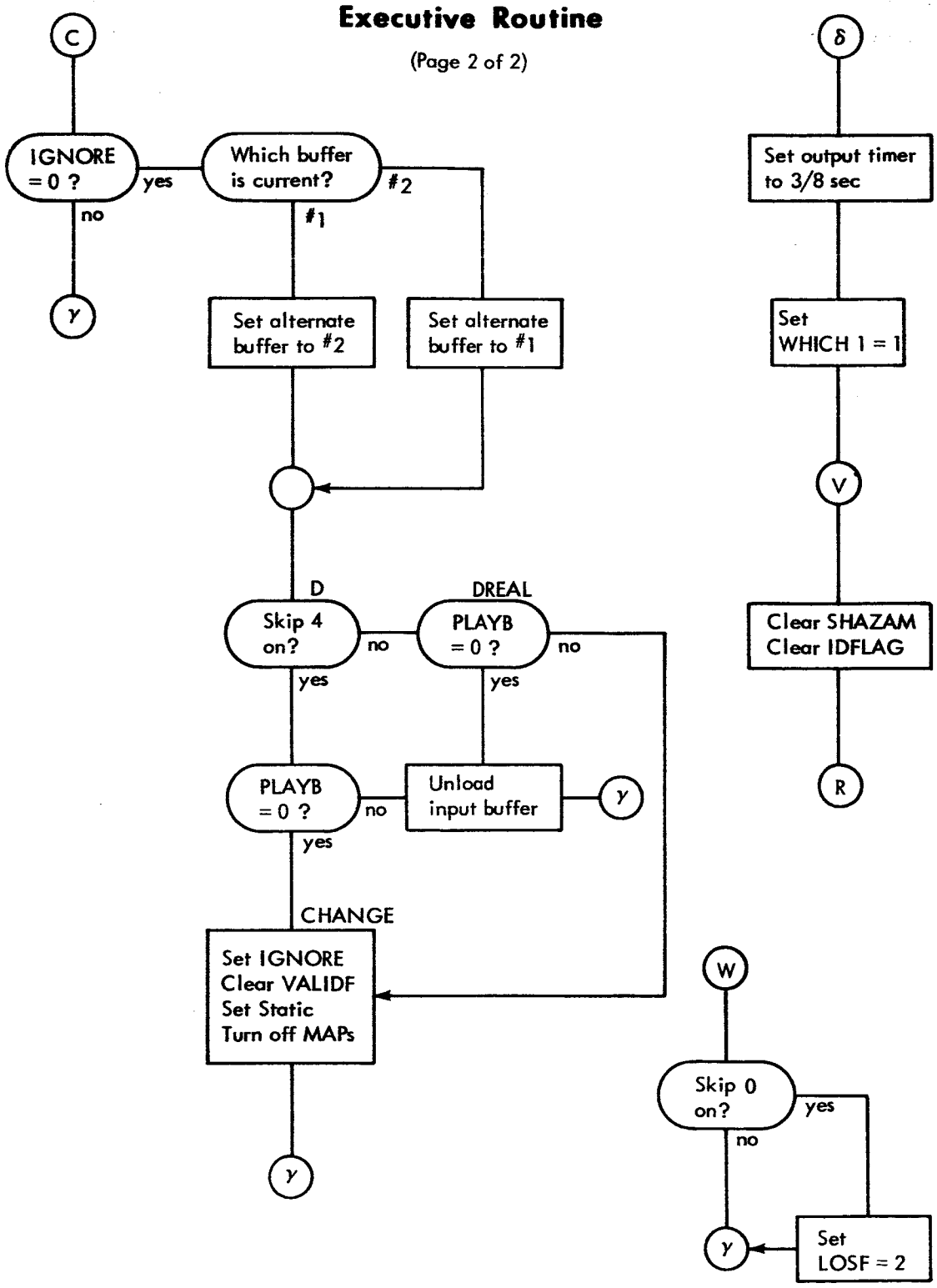
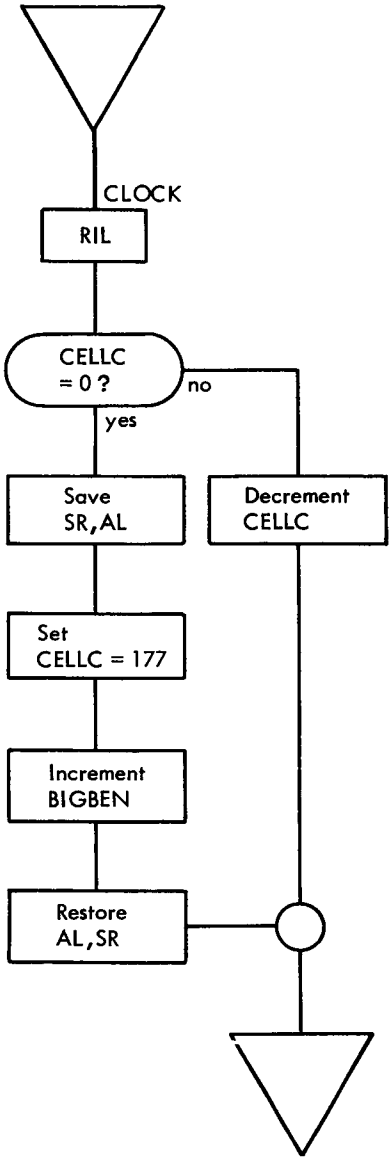


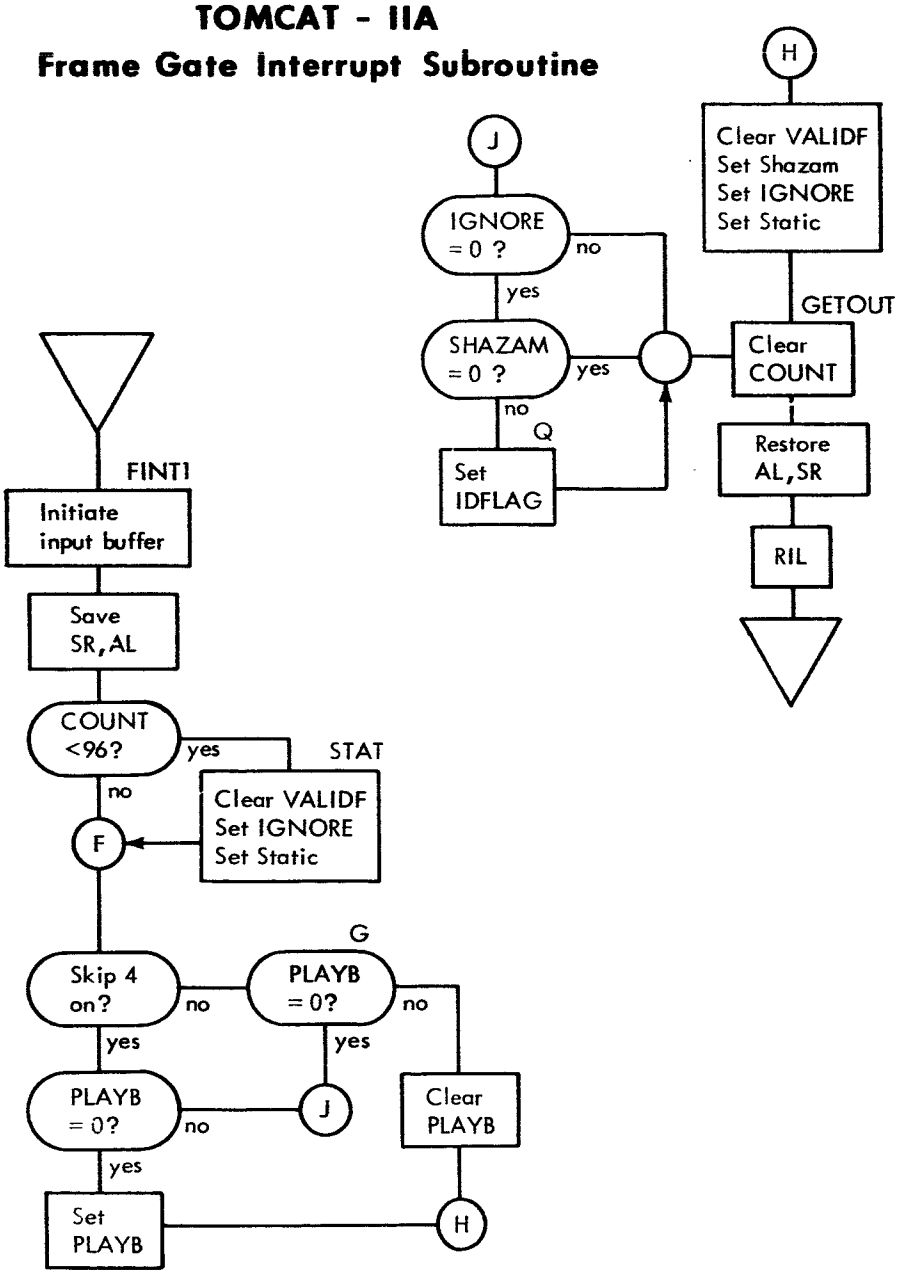
The Synchronizing Interrupt occurs regularly 1024 times per second, under control of the computer internal clock. This interrupt, which sends control to the CLOCK Subroutine, is used to maintain a program clock of 1/8th-second granularity, by incrementing a counter every 128th interrupt.

TOMCAT IIA
Clock Subroutine



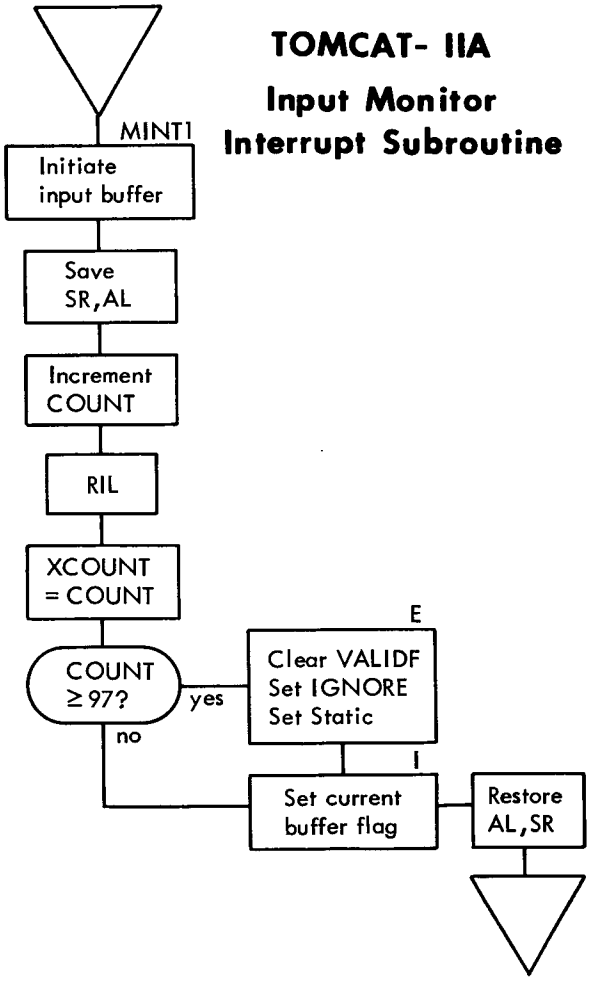
Except for these occasional visits to CLOCK, after EXEC 1 first receives control from BEGIN 1, it idles until an External Interrupt is received. This should ordinarily happen within 2.4 seconds after beginning program operation. This interrupt is generated by the PCM at Frame Gate Reset, and indicates that a complete major frame of data is about to begin. The Frame Gate Interrupt Subroutine (FINT 1) is entered at this time, and immediately initiates the first input buffer, which the PCM then proceeds to fill with the incoming data stream.

TOMCAT - IIA
Frame Gate Interrupt Subroutine



Control is returned to EXEC 1, which again idles until the input buffer is full. At this time a programmed Input Monitor Interrupt occurs, which sends control to the MINT 1 Subroutine. This subroutine initiates the alternate input buffer and increments the frame counter, whose purpose it is to keep track of which input buffer has just been completed.

When the Executive receives control again it addresses the LIST, which then uses the frame counter to locate the appropriate transfer table, telling it which parameters to remove from the just-completed input buffer and where to put them in the output buffer.

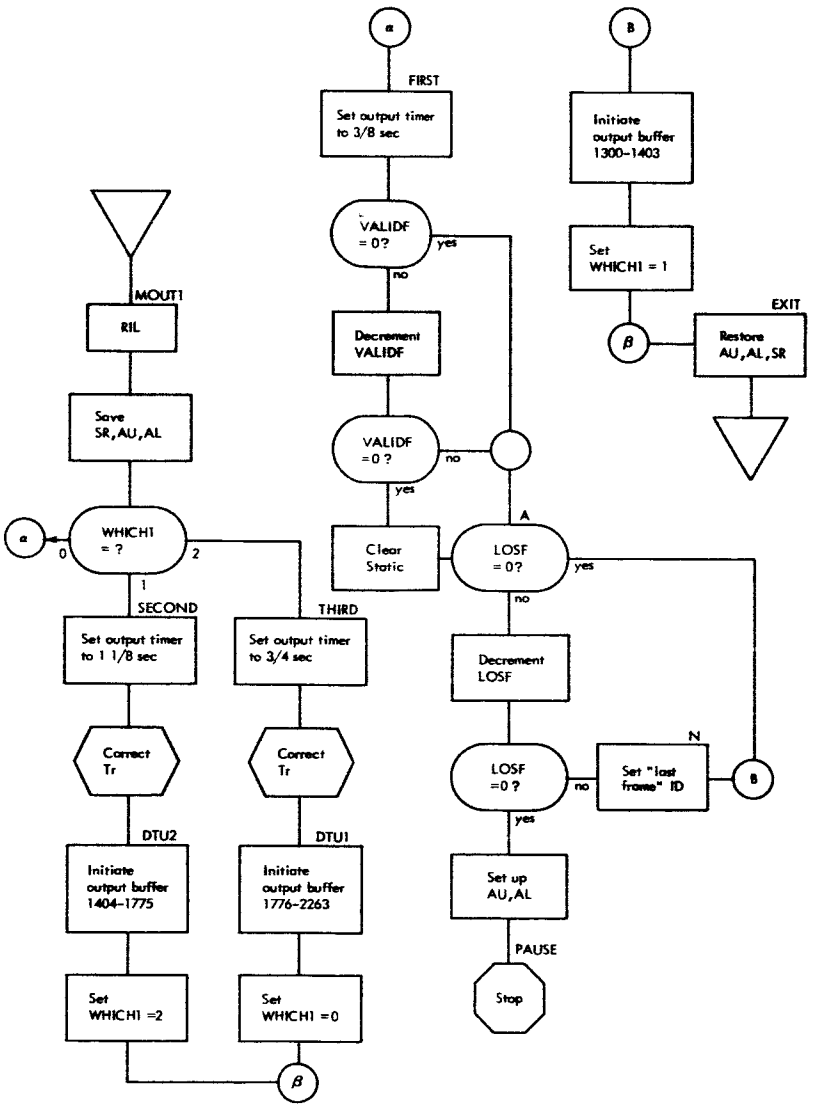


As successive input buffers are filled, the MINT 1 is entered each time, to initiate the alternate buffer and increment the frame counter. Then the Executive calls up the LIST to transfer the appropriate input parameters to their places in the output buffer.

When the Frame Gate Interrupt is received for the second time, the entire process is repeated. But in addition, if no anomalies have been detected, the output buffer is now full of data, and hence the program is ready to begin outputting. Hence when control is returned to the Executive at this time, it initiates the first output buffer.

When this buffer has been read out, an Output Monitor Interrupt occurs under program control, and the MOUT 1 Subroutine is entered. This subroutine initiates the next output buffer, and continues in this manner to initiate succeeding output buffers as the preceding ones are emptied.

TOMCAT - IIA
Output Monitor Interrupt Subroutine



The program continues to operate in this manner until the Executive detects Skip Key Ø turned on and off (Step 12 of the Operating Instructions). When this occurs, the Executive causes one last buffer to be sent out (including a code word to indicate that the program is about to shut down), and comes to an orderly halt.

Several special features have not been mentioned in this description. They will be covered in detail later on in this report. The complete core program listing for the TOMCAT-II A program as used for GT-3 is presented in Appendix B. The LIST used for TOMCAT-II A is nearly identical to the Gemini Real-Time LISTGR of TOMCAT-II B, which is contained in the TOMCAT-II B program listing in Appendix C.

TOMCAT-II B

The basic B program parallels the A program so far as its general manner of operation is concerned. The difference is primarily one of versatility and some automatic switching features. For example, where the A program is limited to processing Gemini Real-Time data only, the B program can handle either Gemini and Agena data in either the Real-Time or Dump modes. Furthermore, where the A program was limited to inputting on only one channel, the B program has the capability of handling two PCM sets on two input channels, switching automatically from one to the other as required to find the proper data for processing. There are also several refinements made in the data handling procedure to improve program operation. However, the basic philosophy of the program operation is identical to that of TOMCAT-II A, i.e., they both operate in the general manner described earlier.

Brief TOMCAT-II B Program Description

The Operating Instructions for the B program are only slightly changed from those in the A program (a prime (') indicates that an Instruction or Note is changed from the corresponding entry in the A program). Steps 8 and 9 in particular have to be refined to allow for the increased sophistication found in TOMCAT-II B, as follows:

TOMCAT-II B
Operating Instructions

1'. Check that the PCMs and DTU are in a POWER ON condition.

2'. Load UPAK-IA or UPAK-IB at 26000.

3. Using the UPAK, store the constant "000000" (zero) throughout memory.

4'. Using the UPAK, load TOMCAT-II B tape and verify.

5. Place the internal SYNC switches on the computer control panel at INT and ON.

6. Turn off all Stop and Skip Keys.

7. Master clear.

8'. (i) Set SKIP KEY 2 if data to be processed is Agena; leave SKIP KEY 2 off for Gemini data.
(ii) Set SKIP KEY 3 if data to be processed is Dump data (from the spacecraft tape recorder); leave SKIP KEY 3 off for Real-Time data.
(iii) Set SKIP KEY 4 if data to be processed is Tape Playback from the ground station tape recorder; leave SKIP KEY 4 off if data is Live (directly from the spacecraft).
See Note 2'.

9'. If the inputs to the computer are to be on channels other than Channel 6 and Channel 7, set $(AL)_{5-3}$ to the lower-numbered input channel and $(AL)_{2-0}$ to the higher-numbered input channel. See Note 4. If the output from the computer is to be on a channel other than Channel 5, set $(AU)_{2-0}$ to the output channel number.

10. Set P = 5000.

11. Start. The program will begin operation. See Note 1.

12'. At LOS, or at any other time the operator wishes to cease program operation and bring the computer to an orderly halt, turn SKIP KEY Ø on and off. See Note 3'.

Notes

1. The program may be reinitialized at any time by returning to Step 6.

2'. The Skip Keys may be set or cleared as required without halting program operation.

3'. When the program senses Skip Key Ø turned on and off, it sends one last output buffer of data and labels it to notify the receiver it is about to cease sending, and comes to a Stop 5 with $(AU)_{2-0}$ = output channel number, $(AL)_{5-3}$ = lower-numbered input channel number, $(AL)_{2-0}$ = higher-numbered input channel number, and P = 5000. To restart, simply depress start switch.

4. The computer will always set up for two-channel operation. If only one channel is to be used, and it is either Channel 6 or Channel 7, AL may be left cleared and the computer will set up on 6 and 7, but of course will not see any data on the channel not in use. If only one channel is to be used, and it is not Channel 6 or Channel 7, set $(AL)_{2-0}$ to the input channel number. The computer will set up on the specified channel and on Channel 7, but of course will not see any data on Channel 7.

The program allows for different kinds of data input, and for two channels of input, as follows. The computer operator informs the program which kind of data it is to process by his settings of Skip Key 2 (Gemini/Agena) and Skip Key 3 (Real-Time/Dump) (Step 8' of the Operating Instructions). He also informs the program on which two channels the data may be found (the two PCM input channels) (Step 9' of the Operating Instructions). When the computer is then started (Steps 10 and 11 of the Operating Instructions), it sets itself up to input data on both of the specified input channels, and then when it is set up, attempts to bring in one data word on each of the two channels. If it is successful in bringing in a word on either or both channels, it examines the control bits of the word or words it brought in. These control bits are the most significant five bits of the 18-bit input word, and have the following meaning:

Bit	Meaning
2^{17}	Agena Dump data
2^{16}	Agena Real-Time data
2^{15}	Gemini Dump data
2^{14}	Gemini Real-Time data
2^{13}	Priority Bit

If the computer finds that neither of the input words contains the proper Data Control Bit (2^{17} to 2^{14}) (i.e., excluding the Priority Bit) to correspond

to the setting of Skip Keys 2 and 3, it waits a while, and then attempts to bring in two more words, one on each channel, as before. It continues to search in this manner, until at last one or both of the input words is found to contain the proper bit. If just one of the input channels has the right kind of data, the computer sets up to process data from that channel. If both channels have the right kind of data, the computer then looks at the Priority Bit (2^{13}), and sets itself up to process the channel of data on which this bit is set.

From this point on, although from a programming standpoint the B program is quite different from the A program, nevertheless it operates in quite a similar way as that described earlier for TOMCAT-II A. The technical details are covered later in this report.

If at any time the operator desires to change the kind of data being processed or the PCM input channel, all he need do is set the Skip Keys appropriately and/or change either or both of the PCM inputs. The program will automatically adjust itself to the new requirements as they are set on the Skip Keys, and will return as necessary to find an input channel which contains the exact kind of data it is being requested to process. In the meantime, once the computer begins outputting, it will never cease, until it senses the Skip Key $\emptyset$ set (Step 12' of the Operating Instructions). Even when the computer is looking for a new kind of data, it continues to send out the last available of the old parameters, identifying them then as "static" (invalid) data which is not up-to-date.

Detailed TOMCAT-II B Program Description

The program is entered at the first initialization routine BEGIN 1. This routine sets up the computer to communicate properly with its input and output devices (the PCMs and the DTU), and also sets up those parts of the program which do not depend on the particular kind of data to be processed.

Just before exiting, BEGIN 1 calls up the subroutine WATCHdog. The main function of this subroutine in this instance is to examine the Skip Keys 2 and 3 (which indicate the kind of data the computer is supposed to process), and to set flags to indicate the initial skip key settings. BEGIN 1 then exits directly to the SEARCH routine.

The SEARCH routine examines the control bits of the data available on each of the input channels, in an effort to locate the kind of data specified by the skip key settings. If this search proves unsuccessful (in the sense that the proper kind of data is not found on either input channel), SEARCH exits directly to the NODATA routine.

This routine at first continues to return to the WATCHdog-SEARCH sequence in a renewed effort to locate the kind of data requested on the skip keys. After six seconds of this re-examination of the inputs, however, if it is still unsuccessful at locating the proper input, NODATA prints a message on the I/O Console, identifying the kind of data requested and the input channels being searched. After the message is sent, NODATA returns to the WATCHdog-SEARCH sequence and continues to look for proper data. It will continue indefinitely to loop in this manner if it continues to be unable to locate proper input, printing an appropriate message from time to time.

When SEARCH finally locates the proper kind of data on one of the input channels, it exits to the second initialization routine BEGIN 2. This routine completes the initialization of the program, enabling it to begin processing the data now available on the selected input channel. BEGIN 2 then exits directly to the EXECutive routine, which is responsible for the actual processing.

The main function of the EXECutive routine is to monitor the operation of the Interrupt Subroutines, and call up the appropriate Processor Subroutines as they are required. To this end, the EXECutive loops endlessly, examining each Interrupt Flag at least once in each loop. When it finds a flag set (indicating that the corresponding Interrupt Subroutine has just serviced its interrupt), the routine calls up the appropriate Processor Subroutine. In addition to monitoring these Interrupt Flags, the EXECutive calls up the WATCHdog Subroutine once each loop.

In this instance, the WATCHdog has several more functions to perform than were indicated earlier.

(1) It checks Skip Key Ø, which is set to indicate LOS. If LOS has occurred, appropriate flags are set.

(2) It looks at Skip Keys 2 and 3, which indicate kind of data (Gemini/Agena and Real-Time/Dump, respectively), to see if these have been changed since the previous loop. If so, appropriate flags are set.

(3) It examines the input timer, to see whether it is taking too long to input a buffer of data. If so, the data has either been inhibited because of an out-of-sync condition at the PCM, or has been terminated completely, perhaps because of PCM malfunction. In any case, the subroutine checks the alternate input channel, and if proper data is found there, proceeds directly to BEGIN 2 to re-initialize the program to process the data from the alternate channel. On the other hand, if the alternate channel does not contain proper data, the input timer is reset and the computer continues to attempt input on the original channel.

(4) It checks the output timer to determine whether the computer is taking too long to output a buffer of data. If so, the DTU has hung itself up (due to an interim hardware problem), and the computer restarts the DTU, re-initializes the output buffer, and resets the timer.

(5) It looks at Skip Key 4 (Live/Tape Playback) to see whether the setting has been changed since the previous loop. If so the Message Label in the output buffer is changed and appropriate flags are set.

Immediately upon re-entry from WATCHdog, the EXECutive checks to see whether the WATCHdog had found that the kind of data requested to be processed had changed. If so, the routine exits directly to the SEARCH routine, beginning anew the entire sequence. Otherwise, EXECutive continues to loop, looking for interrupt flags.

There are four Interrupt Subroutines—CLOCK, Frame Gate, Input Monitor and Output Monitor, which correspond respectively to the Synchronizing, External, Input Monitor and Output Monitor Interrupts. The Frame Gate and Input Monitor Interrupt Subroutines also have associated Interrupt Flags, which the EXECutive responds to by calling up the corresponding Processor Subroutines.

The CLOCK Subroutine maintains two separate clocks—one of 1/512th-second granularity and one of 1/8th-second granularity—from the Synchronizing Interrupt (computer internal clock). This interrupt occurs each 1/1024th second, and the clocks are simply counters which are incremented every 2nd and 128th interrupt, respectively. These clocks are used for various timing purposes throughout the program.

The Frame Gate Interrupt Subroutine FINT is entered upon occurrence of the External Interrupt, which signals the beginning of a 2.4-second cycle of data. The subroutine initiates the first input buffer and sets its Interrupt Flag. When the EXECutive detects this flag, it calls up the Frame Gate Interrupt Processor Subroutine FINTP.

The subroutine FINTP has several functions. First, it checks the validity of the previous cycle of data. If it finds that no alarm flags were set during the previous cycle of data and that the cycle had the proper length, it sets flags which will eventually have the output buffer validated. Secondly, the subroutine has the additional task of initiating the first output buffer at the beginning of each pass (succeeding output buffers are initiated automatically by MOUT; see below). Finally, before returning control to the EXECutive, the subroutine initializes the program areas necessary to input the next cycle of data.

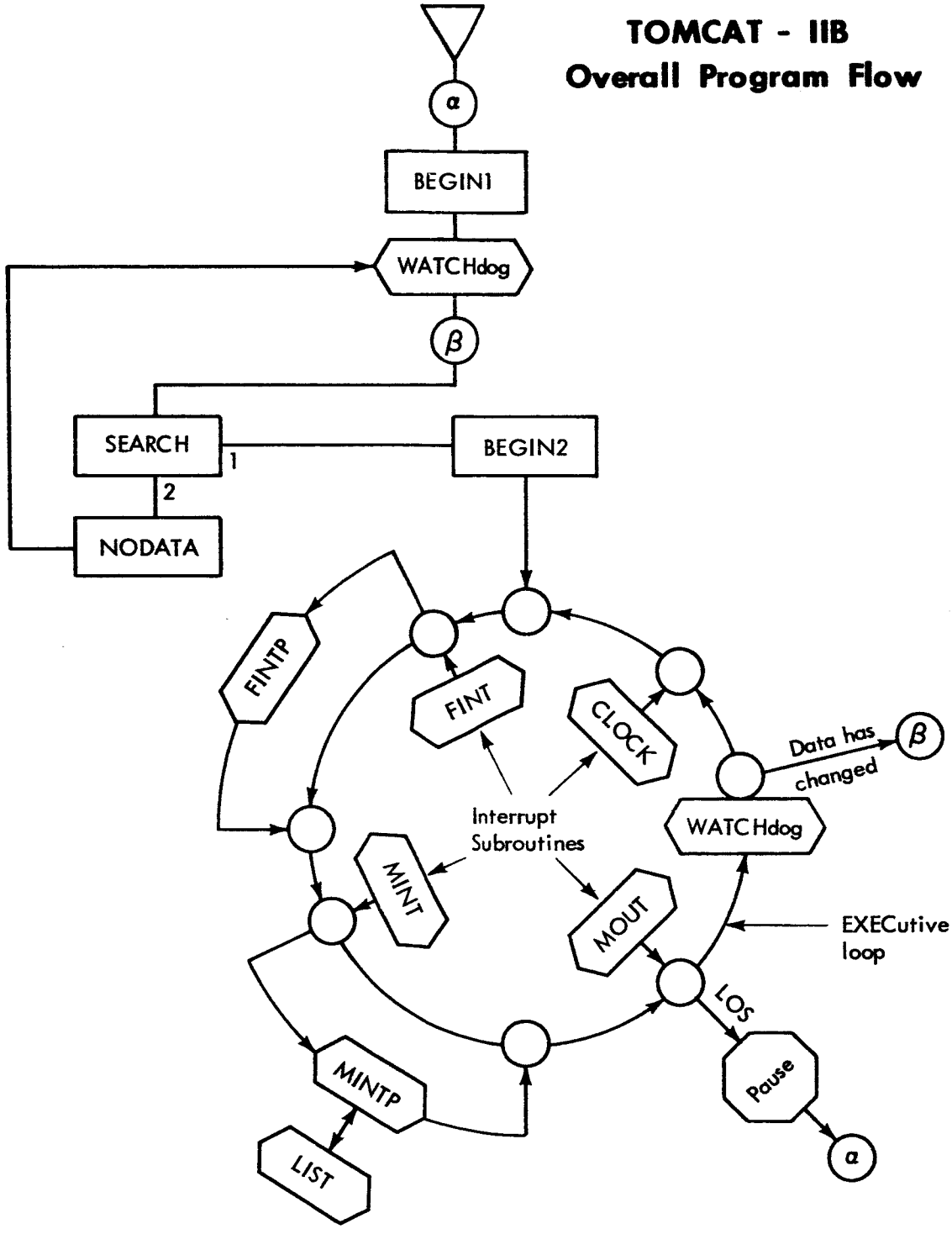
The Input Monitor Interrupt Subroutines MINTGR, MINTGD and MINTA—operating respectively in the Gemini Real-Time, Gemini Dump and Agena modes—are entered upon occurrence of an Input Monitor Interrupt. This interrupt is programmed to occur when the buffer inputting the PCM data stream is full. More correctly, the input buffer is divided into separate sections which are individually timed (this feature is discussed later), and the interrupt occurs at the end of each section. If not all sections have been inputted, the subroutine simply resets the input timer and initiates the next section. When the last section (and therefore the entire buffer) is full, the subroutine initiates the first section of the alternate buffer, resets the input timer, and sets its Interrupt Flag. When the EXECutive detects this flag, it calls up the Input Monitor Processor Subroutine MINTP.

The Subroutine MINTP counts the buffers as they are completed, and compares this count against the number which should be completed before the next Frame Gate Interrupt (FGI). Then it checks the validity of the input buffer, by declaring any buffer invalid either if too many buffers have come in before the FGI, or if the control bits of any data words in the input buffer are incorrect. If the input buffer is declared to be valid, MINTP calls up the LIST Subroutine to transfer the data to the output buffer.

The appropriate subroutine LISTGR, LISTGD or LISTA (for Gemini Real-Time, Gemini Dump or Agena, respectively) selects particular parameters from the input buffer and stores them in preselected slots in the output buffer. Exactly which parameters are to be picked up and where they are to be stored is determined by a table which is addressed by means of the count that MINTP kept of the number of input buffers since the last FGI. The subroutine also has the capability (which is discussed later) of assuring the integrity of 24-bit parameters. The subroutine LISTGR has the additional features of time-tagging the Tr (time-to-retrofire clock) to enable the output routine to correct it for the time spent in the computer before being outputted, and guaranteeing the transmission of valid Message Acceptance Pulses (MAP) for the Digital Command System (DCS).

The appropriate Output Monitor Interrupt Subroutine MOUTGR or MOUTU (for Gemini Real-Time or Universal, respectively) is entered upon occurrence of an Output Monitor Interrupt. This interrupt is programmed to occur when the computer has just finished outputting a complete buffer to the Data Transmission Unit (DTU). In certain circumstances, the subroutine first validates the just-transmitted data. Also, if LOS has occurred, the subroutine sends a "last buffer" code word to indicate it is about to shut down. In any event, it initiates the next output buffer. The subroutine MOUTGR contains in addition a feature which enables the computer to pause twice during the output cycle for the purpose of updating the Tr clock just before sending it out.

TOMCAT - IIB
Overall Program Flow



NOTE: SEARCH takes Exit 1 if valid data is available from the PCM, and Exit 2 if not available

Summary of Program Flags, Counters and Parameters

The following list is an attempt to provide the reader with a handy reference to the use of variables in the program. The variables are arranged in alphabetical order, together with an indication of their type, the routines and/or subroutines which use them, and a brief explanation of their function (a detailed understanding of their use can be acquired only by careful study of the routines and subroutines involved).

Each variable is categorized as one of the following:

F = Flag, a location whose contents are normally "off" or "0", but are turned "on", usually to "1", to indicate that some specific action should be taken.

C = Counter, a location whose contents can assume serial values, either forwards, from zero up to some fixed maximum, or backwards from some fixed maximum down to zero.

P = Parameter, a location whose contents remain constant during the running of the processing program, but may be changed by initialization to change the processing conditions.

Variable	Type	Places Used	Meaning
B_1	C	MINT FINTP	B—register #1. Used directly to initiate next section of input buffer when previous section terminates. B_1 is set to zero when Section A is initiated, then incremented for each succeeding section, until Section A of the alternate buffer is initiated, when B_1 is zeroed again.
B_6	F	LISTGR	B—register #6. Set to indicate that a new pattern (either MAP or MUP) should be stored in the LA01 locations in the output buffer.
BUFCR	P	LIST	Initialized to "41 + 2K", where K is the output channel number (the channel to which the DTU is connected). This value is the address of the "current address" portion of the

Variable	Type	Places Used	Meaning
			output buffer control register, and is used to set up the program properly to handle the 24-bit parameters.
BUFLAG	C	MINT MINTP FINTP	Set to number of sections in an input buffer every other frame, then decremented when each section is terminated. When nonzero, diverts data train to buffer #1; when zero, diverts train to buffer #2.
BUFNOW	C	MINTP FINTP	Current input buffer indicator, "1" for buffer #1, "0" for buffer #2.
BUFNUM	P	MINTP FINTP	Initialized to the number of sections in an input buffer; used to reset BUFLAG.
CELLB	C	CLOCK	Decremented from "77_8" down to zero, at which time the clock BIGBEN is incremented, and CELLB is reset to "77_8".
CELLC	C	CLOCK	Decremented from "1" down to zero, at which time the clock TIKTOK is incremented and CELLC is reset to "1".
CHANGE	F	WATCH MINTP EXEC	Set when Skip Keys 2 or 3 are changed, or if Data Control Bit of input data changes. Diverts program operation to the SEARCH Subroutine to find new data.
CHANLX	P	SEARCH	Initialized to "X", one of the input channel numbers (channel to which one of the PCMs is connected).
CHANLY	P	SEARCH	Initialized to "Y", the second input channel number (channel to which the second PCM is connected).
CHANNL	P	WATCH SEARCH	Initialized (in SEARCH or WATCHdog) to the channel number on which the required kind of input data is to be found.

Variable	Type	Places Used	Meaning
CHNGE 1	F	WATCH MINTP	Set along with CHANGE. Causes proper new Data Control Bit to be put in CNTROL.
CNTROL	P	WATCH MINTP SEARCH	Initialized (in WATCHdog) to the control bits which proper input data must contain.
COUNT	C	MINTP FINTP	Frame counter. Set to zero at Frame Gate Interrupt, incremented each frame until the next Frame Gate.
FILMAP	C	LIST Others	Set to "2" during initialization for the list to initialize itself. Set to "1" by various subroutines for LISTGR to turn off the MAPs in the output buffer. Set to "0" for normal operations of the LIST, to transfer input data to the output buffer.
FINTF	F	FINT EXEC	Frame Gate Interrupt Flag. Turned on to indicate Frame Gate Interrupt has been serviced and Processor Subroutine FINTP should be called up.
GEMINI	P	WATCH NODATA	Initialized (in WATCHdog) to the setting of Skip Key 2. Set to "1" if Skip Key 2 is "off" (GEMINI data), "0" if Skip Key 2 is "on" (Agena Data).
IGNOR 1	F	Various	General alarm flag. Indicates anomaly has occurred, hence that data cycle is invalid and data should not be transferred to output buffer.
IGNOR 2	F	WATCH FINTP MINTP	Indicates Skip Key 4 has been changed, hence that new Message Label should be put in output buffer. Also, data cycle is invalid and data should not be transferred to output buffer.
IGNORF	F	FINTP	Indicates previous cycle of data was invalid.

Variable	Type	Places Used	Meaning
LENGTH	P	MINTP	Initialized to one less than the number of words in an input buffer. Used to set a B-register to check the Data Control Bits of the data in a full input buffer.
LOSF	F	WATCH MOUT	Set when Skip Key Ø is turned on. Causes program eventually to send out last output buffer and come to orderly halt.
LOS1F	F	MOUT	Set when LOSF is found to be on. Causes the computer to come to an orderly halt.
MINTF	F	MINT EXEC	Input Monitor Interrupt Flag. Turned on to indicate Input Monitor Interrupt has occurred and Processor Subroutine MINTP should be called up.
NCHANL	P	WATCH SEARCH	Initialized (in SEARCH or WATCHdog) to the alternate channel number, the channel on which the required kind of input data is not to be found.
NODATF	C	NODATA WATCH	Counts down from some initial value to zero, to control the number of times NODATA will return to the WATCHdog-SEARCH sequence in an effort to locate proper data for processing. When NODATF reaches zero, a message is printed out calling attention to the lack of proper data.
NUMBER	P	MINTP FINTP	Initialized to the number of input frames in a data cycle, i.e., the value which the frame counter COUNT should have reached when a Frame Gate Interrupt occurs.
PLAYB	P	WATCH FINTP	Initialized (in WATCHdog) to the setting of Skip Key 4. Set to "1" if Skip Key 4 is "on" (PCM Tape Playback mode), "0" if Skip Key 4 is "off" (PCM Live mode).

Variable	Type	Places Used	Meaning
REAL	P	WATCH NODATA FINTP	Initialized (in WATCHdog) to the setting of Skip Key 3. Set to "1" if Skip Key 3 is "off" (spacecraft Real-Time mode), "0" if Skip Key 3 is "on" (spacecraft Dump mode).
STARTF	F	FINTP	Initialized to "1" at start of program, indicates output has not been initiated.
Static	F	MOUT Others	Status Word (Slot 5 of the output buffer). Whenever data is being processed, this word will be in one of two states, to report on the previous output buffer: "Static" (currently "200"), if the buffer was invalid; "Valid" (currently "300"), if the buffer was valid.
SWITCH	F	WATCH BEGIN 2	Set when the WATCHdog determines that channels have to be changed, but not the kind of data. Then BEGIN 2 will initialize the program to handle the old kind of data on the new input channel.
TEMP	F	LISTGD	Set to indicate that a 24-bit parameter was not stored in the output buffer during one data transfer sequence, and should be stored during the next sequence. Note that TEMP+4 is used in LISTGR for this purpose, instead of TEMP.
TEMP+4	F	LISTGR	Set to indicate that a 24-bit parameter was not stored in the output buffer during one data transfer sequence, and should be stored during the next sequence. Note that TEMP is used in LISTGD for this purpose, instead of TEMP+4.
VALIDF	F	MOUT FINTP Others	Set when the first valid data cycle is received following a period of invalid data. Causes the output buffer eventually to be validated.

Variable	Type	Places Used	Meaning
VALID 8	F	MOUT Others	Set when VALIDF is found to be on. Causes succeeding output buffers to be validated.
WHICH 1	C	MOUTGR FINTP	Set to "0", "1", or "2", to indicate which section of output buffer is to be initiated next.
XCOUNT	C	MINTP LIST	Frame counter. Set to incremented value of COUNT, used to pick up correct Data Transfer Table.
XFLAG	F	SEARCH	Set if proper kind of input data is found on Channel "X".
YFLAG	F	SEARCH	Set if proper kind of input data is found on Channel "Y".

Routines and Subroutines

Name—First Initialization Routine.

Mnemonic—BEGIN 1.

Function—Sets up the computer for TOMCAT-II B operation, and sets up those parts of the program which do not depend on the specific kind of data to be processed.

Input—Initial AU and AL settings.

Output—All routines, subroutines, program flags and counters properly set up, insofar as this can be done without knowing the specific kind of data to be processed. The DTU is turned on. The WATCHdog Subroutine is addressed to determine the processing requirements, and the routine then exits directly to the SEARCH Routine.

Operation—This is the routine first entered when the start switch is depressed (Step 11 of the Operating Instructions). Interrupts are immediately disabled and remain so during the entire routine. The initial AU and AL settings are saved in STORAU and STORAL, respectively.

Then the most significant five digits of STORAU are cleared, and the least significant digit (LSD) is examined. If it is "0", STORAU is set to "000005". Thus STORAU now contains the output channel number (the channel to which the DTU is connected), and is used to initialize those program instructions and parameters which depend on the output channel number.

Then the LSD (call it "D_1") of STORAL is examined. If $D_1 = 0$, CHANLX is set to "000006" and CHANLY to "000007". If $D_1 \neq 0$, CHANLY is set to "00000D_1" and the second least significant digit (call it "D_2") of STORAL is examined. If $D_2 \neq 0$, CHANLX is set to "00000D_2"; if $D_2 = 0$, then CHANLX is set to "000006" if $D_1 = 7$, and to "000007" if $D_1 \neq 7$. Thus (CHANLX) = 00000X and (CHANLY) = 00000Y, where X and Y are the input channel numbers (the channels to which the PCMs are connected). Finally STORAL is set to "0000XY" for future reference, and the channel numbers are then used to initialize appropriate program instructions.

Program parameters are then set to their respective initial values; the buffer control registers are cleared, and RILs are stored in the interrupt entrance registers. The program internal clocks are set up, and the DTU is turned on. Then the WATCHdog Subroutine is addressed so that it may check the skip keys to determine the kind of data processing requested. Finally the routine exits directly to SEARCH.

Name—SEARCH Routine.

Mnemonic—SEARCH.

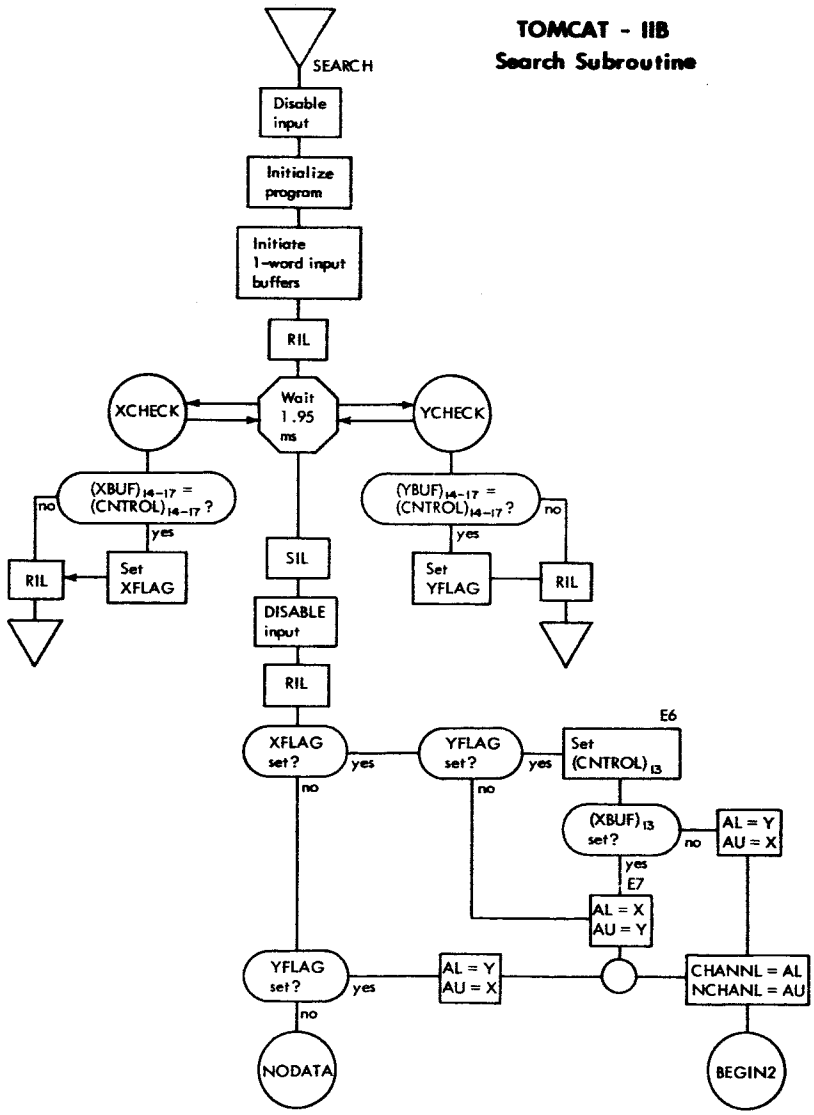
Function—To locate the requested kind of input data for processing.

Input—The word CNTROL, containing the Data Control Bit of the requested kind of data, and input channel numbers CHANLX and CHANLY.

Output—The word CHANNL contains the input channel number on which the proper kind of data was located, and the routine exits directly to BEGIN 2. If the routine was unable to locate proper data, it exits directly to NODATA.

Operation—Any current input is disabled, and then a one-word input buffer with monitor is initiated on each input channel, and interrupts are enabled. A timer is set to 1.95 ms, and at the end of this time, input is again disabled. In the meantime, if a word came in on either or both channels, its Data Control Bit was checked to see if it corresponded to that of CNTROL (the word CNTROL was set by WATCHdog to correspond to the settings of Skip Keys 2 and 3). At the end of the 1.95 ms time interval, the buffers are checked.

If neither of them contained the proper kind of data, the routine exits to the NODATA Routine. If just one buffer contained the proper kind of data, the corresponding channel number is put into CHANNL, and the routine exits to BEGIN2 for final initialization. If both buffers contained the proper kind of data, then the Priority Bit (Bit 13) is checked. This bit is supposed to be set by the PCM operator to indicate to the computer which channel he wants the computer to input. The data in the Channel "X" input buffer is checked, and if Bit 13 is set there, Channel "X" is accepted for processing (CHANNL = CHANLX). Otherwise, Channel "Y" is accepted for processing (CHANNL = CHANLY). In either case, Bit 13 is now added to CNTROL (so that CNTROL now contains both the proper Data Control Bit and the Priority Bit), and the routine exits to BEGIN2 for final initialization.



Name—NODATA Routine

Mnemonic—NODATA

Function—Causes the program to continue looking for proper data to process, and sends out messages from time to time if it cannot find proper data.

Input—Flags GEMINI and REAL indicating the kind of data specified on Skip Keys 2 and 3.

Output—Returns to WATCHdog to see if requirements have changed, and to SEARCH to see if the proper data is still unavailable. From time to time, if proper data cannot be located, prints out a message on the I/O Console advising the computer operator of its difficulty.

Operation—There are two internal counters, NODATF and NODATG, used in the operation of this routine. These counters are each initially set to "3". At first, each time the routine is entered, the counter NODATF is decremented. Then if it is not zero, the routine waits two seconds and then returns to the WATCHdog-SEARCH sequence, attempting again to locate the requested kind of data. NODATF is originally set to "3", so that after being entered three times, it has been decremented to zero. The purpose of this is to give the operator six seconds to make the changeover from one kind of data to the other.

At the end of that time, NODATF and NODATG are set equal to "(NODATG) + 3". This has the effect of setting NODATF to "6". Then the following message is printed on the I/O Console:

(Carriage Return, 2 Line Feeds)

I CAN FIND NO (a) (b) DATA ON CHANNEL (c) or CHANNEL (d).

(Carriage Return, 2 Line Feeds)

The blanks indicated in the above message will contain the following:

(a) "GEMINI" if the flag GEMINI is set, "AGENA" otherwise.

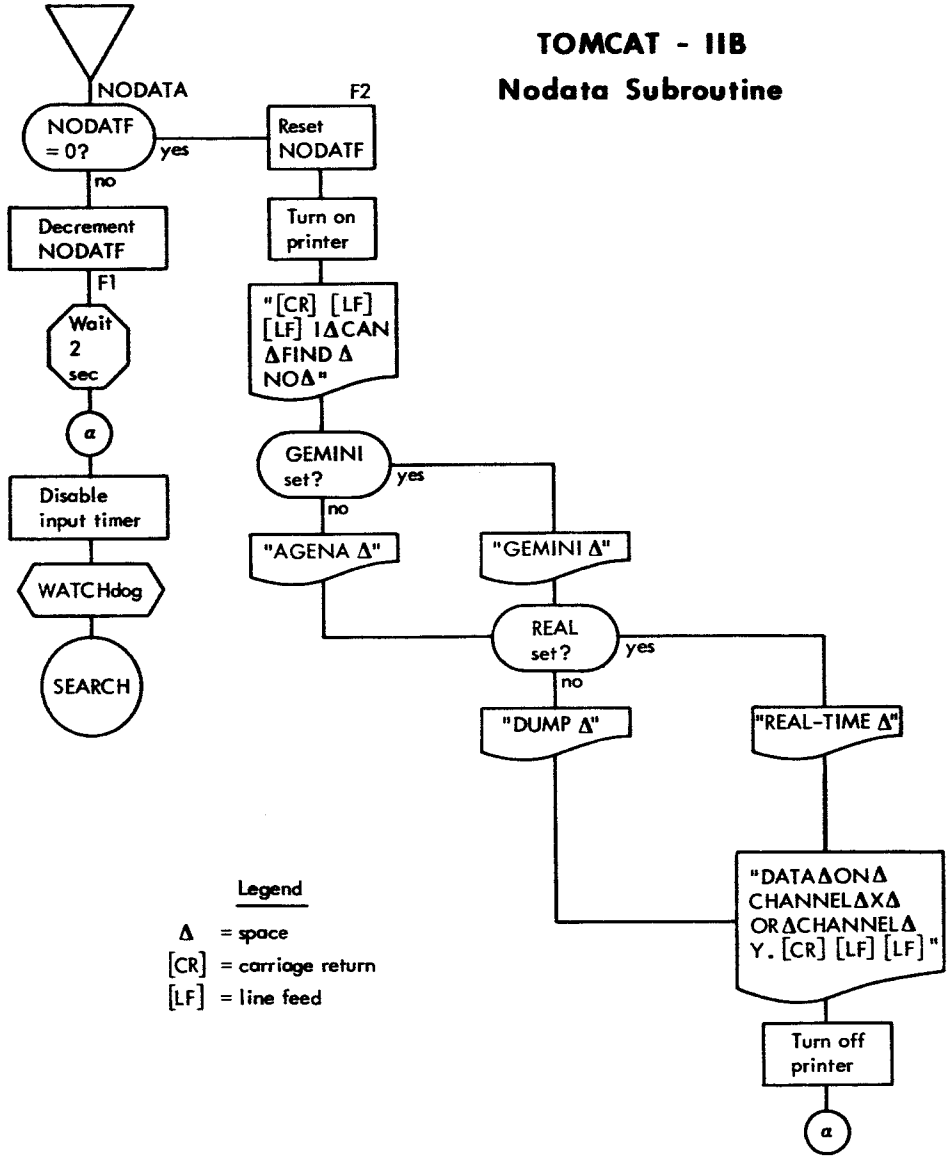
(b) "REAL-TIME" if the flag REAL is set, "DUMP" otherwise.

(c) The channel number found in the word CHANLX.

(d) The channel number found in the word CHANLY.

After the message has been sent out, the routine returns to the WATCHdog-SEARCH sequence in a continued attempt to locate proper data for processing.

It continues looping in this manner, decrementing NODATF each time it enters the routine. Thus after six entries (12 seconds), NODATF will be zero, and the routine will then set NODATF and NODATG to "(NODATG) + 3", (or "9" in this case) send the appropriate message, and continue looping. Thus it will be 18 seconds until the next message, then 24 seconds, then 30 seconds, etc. This decreasing frequency is provided in an attempt to create insistence without annoyance.



Name—Second Initialization Routine

Mnemonic—BEGIN 2

Function—To complete the initialization of the program, setting it up to process the selected kind of data on the selected input channel.

Input—Flags GEMINI and REAL, specifying the kind of data to be processed; words CHANNL, specifying the channel number on which the data is to be found, and NCHANL, specifying the alternate channel number. Flag SWITCH, which is set when only the input channel number, but not the kind of data, is to be changed.

Output—Program completely set up for processing. Exits directly to the Executive Loop.

Operation—First, program parameters are set to their assigned initial values. Then CHANNL is brought in and used to set up those instructions that depend on the input channel number, and NCHANL (containing the alternate channel number, the one which is not to be used) is brought in and used to set up those instructions which refer to the channel not being used. If SWITCH is set, indicating that only the channel number is to be changed, and not the kind of data, then the routine jumps around the next program area. In this area, the input buffers are cleared and the output buffer is loaded with the fill pattern "360_8" ("11110000_2"). Then the program parameters and instructions that depend on the specific kind of data to be processed (according to the flags GEMINI and REAL) are initialized. This includes the input buffer limits, the output buffer sync words, and the choice of MINT (MINTGR, MINTGD, MINTA), MOUT (MOUTGR, MOUTU), and LIST (LISTGR, LISTGD, LISTA) programs.

Finally, the Output Monitor, Input Monitor and External Interrupt Entrance Registers are loaded, the input timer is set to 2.4 seconds (by which time a Frame Gate Interrupt should be received), and the routine exits directly to the Executive Loop.

Name—Executive Loop

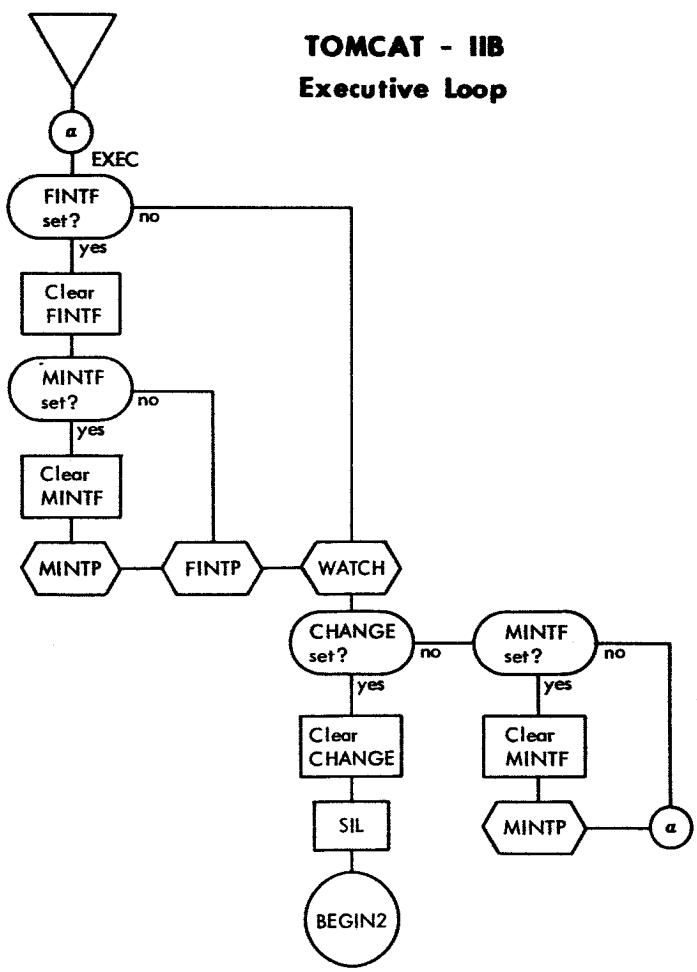
Mnemonic—EXEC

Function—To cycle in a continuous loop, checking the Interrupt Flags, calling up the corresponding Processor Subroutines when it finds an Interrupt Flag set, and calling up the WATCHdog Subroutine.

Input—Interrupt Flags MINTF and FINTF, and CHANGE flag indicating that data requirements have changed.

Output—Ordinarily, none. If CHANGE Flag is set, the routine immediately disables interrupts and jumps to the SEARCH routine.

Operation—This routine is simply a continuous loop, which checks MINTF and FINTF, and calls up WATCHdog. If MINTF is set (meaning that an Input Monitor Interrupt has just been serviced), the Input Monitor Interrupt Processor Subroutine is called. If FINTF is set (meaning that a Frame Gate Interrupt has just been serviced), then MINTF is first checked, and answered if necessary (it has priority, for reasons which will be clear later on when MINTP is discussed), and then the Frame Gate Interrupt Processor Subroutine is called. Then WATCHdog is called, and when it returns to the Executive, the flag CHANGE is observed. If found to be set, the data requirement has been changed and the routine exits directly to SEARCH.



Name—CLOCK Subroutine

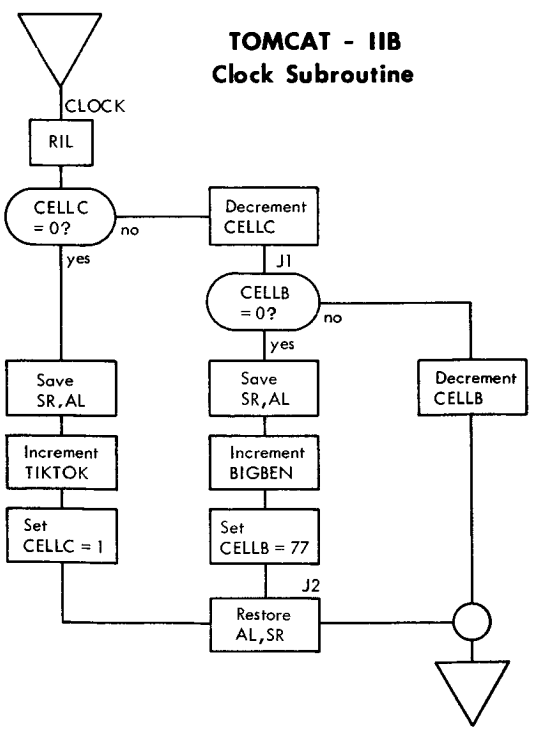
Mnemonic—CLOCK

Function—Maintains two separate clocks—BIGBEN, of 1/8th-second granularity, and TIKTOK, of 1/512th-second (1.95 ms) granularity.

Input—Synchronizing interrupt.

Output—Clocks (counters) BIGBEN and TIKTOK.

Operation—This subroutine is entered upon occurrence of an internal synchronizing interrupt. This interrupt occurs regularly 1024 times per second under control of the computer internal clock. The subroutine flip-flops between two different tasks on alternate interrupts (let us call them "even" and "odd"). On even interrupts, i.e., 512 times per second or each 1.95 ms, the clock (counter) TIKTOK is incremented, and the subroutine is exited. On odd interrupts, the counter CELLB is observed. If it is not zero, it is decremented by one and the subroutine is exited. On the other hand, if CELLB has reached zero, it is reset to its initial value of 63_{10}, and the clock (counter) BIGBEN is incremented. This technique will increment BIGBEN regularly eight times per second (each 125 ms). Then the subroutine is exited.



Name—Frame Gate Interrupt Routine

Mnemonic—FINT

Function—Initiates the first section of the first input buffer at the beginning of each 2.4-second cycle of data, and sets the Frame Gate Interrupt Flag.

Input—External Interrupt (sent by PCM at Frame Gate Reset).

Output—Initiates input buffer 1A; sets FINTF.

Operation—Immediately upon answering the External Interrupt, the first section of the first input buffer is initiated ("input buffer 1A"). Then the Frame Gate Interrupt Flag FINTF is set, so that the Executive Routine will know that a Frame Gate Interrupt has occurred (and hence that the Frame Gate Processor Subroutine should be called). Then the Subroutine enables interrupts and exits.

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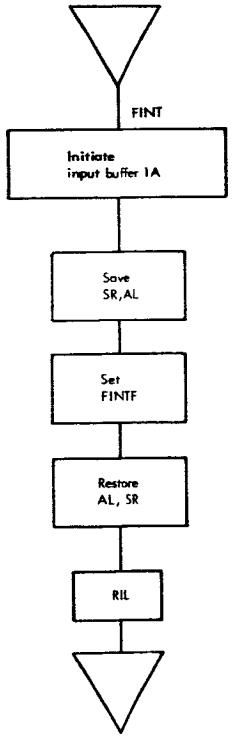
Frame Gate Interrupt Subroutine



Name—Frame Gate Interrupt Processor Subroutine

Mnemonic—FINTP

Function—Checks the validity of the previous cycle of data, and if found to be valid, sets in motion a sequence which will eventually validate the output buffer. Also this subroutine sets the Message Label in the output buffer, and initiates the first output buffer at the beginning of each pass, when valid data is first received. Finally, it initializes the program properly to process the incoming data cycle.

Input—Frame counter COUNT, flags IGNOR 1, IGNOR 2 and STARTF.

Output—The exact output depends on the interrelation among several flags, and is too complicated to be given briefly here (but see the later section of this report entitled "Special Features"). Briefly, the subroutine sets flags either to initiate or terminate a sequence which validates the output buffer, depending on whether the subroutine found the previous cycle(s) of data valid or invalid. In addition, the proper Message Label is set into Slot 4 of the output buffer, the first full output buffer of valid data is initiated at the beginning of each pass, the frame counter COUNT and the program clock TIKTOK are zeroed, a timer is started on the input, and other internal input flags are properly set up.

Operation—The subroutine is called up by the Executive when EXEC sees the Frame Gate Interrupt Flag FINTF set. The subroutine first checks the validity of the previous cycle of data. It does this in three ways. First, it checks the frame counter COUNT to see that the previous cycle was "long enough", i.e., that enough frames of data came in. If not, then it assigns "alarm" values to the "alarm sequence" flags (the alarm sequence of flags is explained in some detail in "Special Features"). Secondly, it examines the general alarm flag IGNOR 1 (if found to be set, the previous cycle is deemed invalid). Thirdly, it examines the "changed data" flag IGNOR 2. If set, the kind of input data has changed during the previous cycle, and besides calling the cycle invalid, the subroutine writes the new Message Label in Slot 4 of the output buffer. Now if for any of these three reasons, the previous input cycle is deemed invalid, the subroutine sets the internal flag IGNORF and jumps to the last block of instructions.

If on the other hand, the subroutine can find no evidence that the previous cycle of data was invalid, it deems the data valid, and immediately checks the flag IGNORF. If IGNORF is not set, it will mean that the previous cycle was also valid, and hence that everything has been (and still is) running smoothly. In this case, no special action need be taken, and the subroutine jumps to the last

block of instructions. However, if IGNORF is found to be set, then it is turned off, and the next block of instructions is entered. The reasoning here is that the previous cycle of valid data was the first such cycle immediately following a period of invalid data. That is, the input has just changed from invalid to valid. Thus the output buffer, which had therefore contained invalid data for some time, has now been filled with valid data. Hence the subroutine sets VALIDF, which the Output Monitor Interrupt Subroutine will use to validate the next output buffer it sends out.

The flag STARTF is examined. If set, it is turned off, and the output is initiated. The flag STARTF is set only in BEGIN 1, so that once it gets turned off here, it will never get set again during the pass. Thus, when the first full cycle of valid data is received at the beginning of a pass, the output is started, and will not halt until Skip Key Ø is set (signifying LOS; see below).

Now the last block of instructions is entered, which sets up the program properly to handle the incoming cycle. The frame counter COUNT and the clock TIKTOK are reset to zero, and flags are set for the proper running of the appropriate Input Monitor Interrupt Subroutine and its associated Processor Subroutine MINTP. Finally the input timer is started and the subroutine exits.

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Frame Gate Interrupt Processor Subroutine

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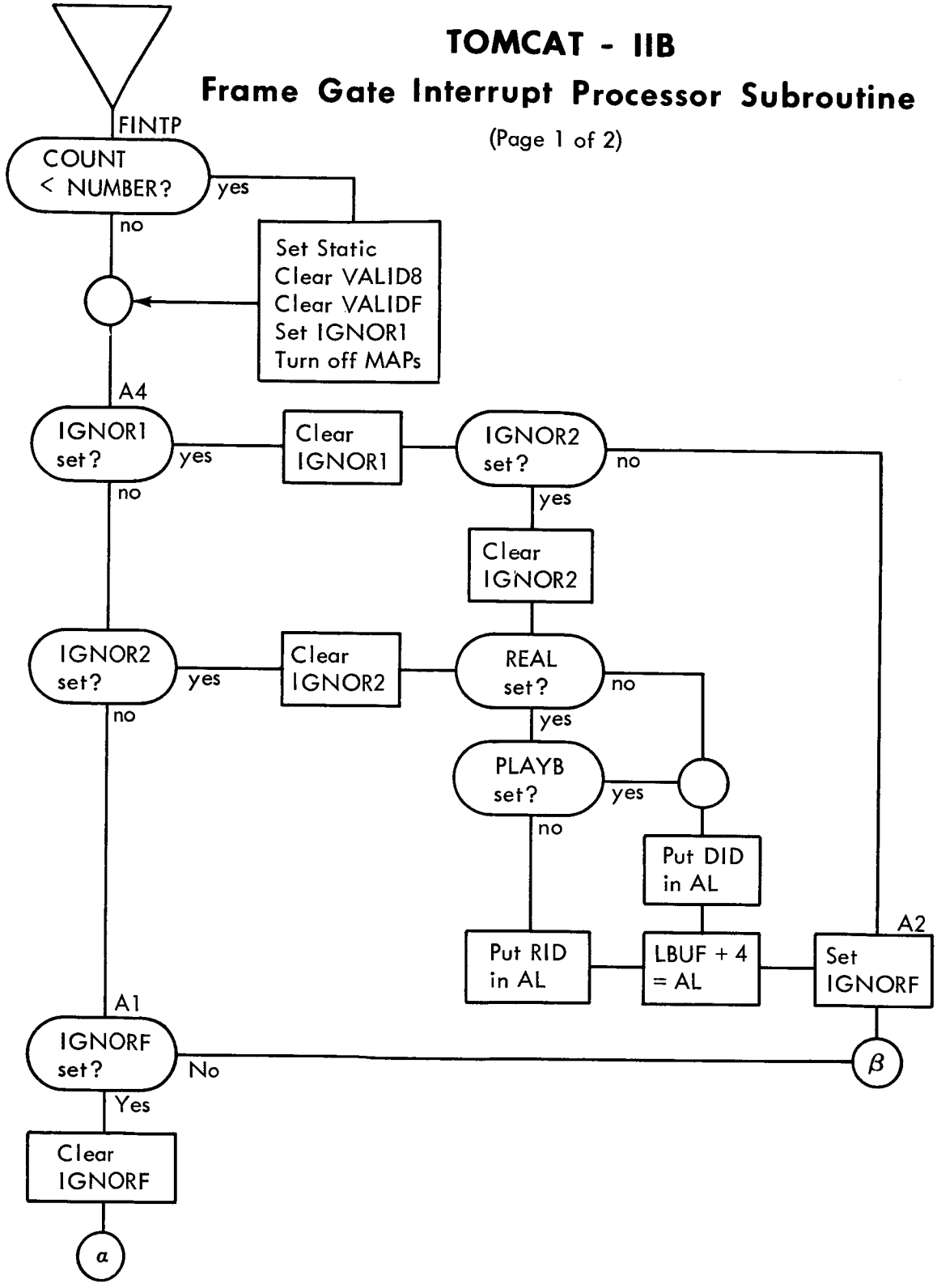
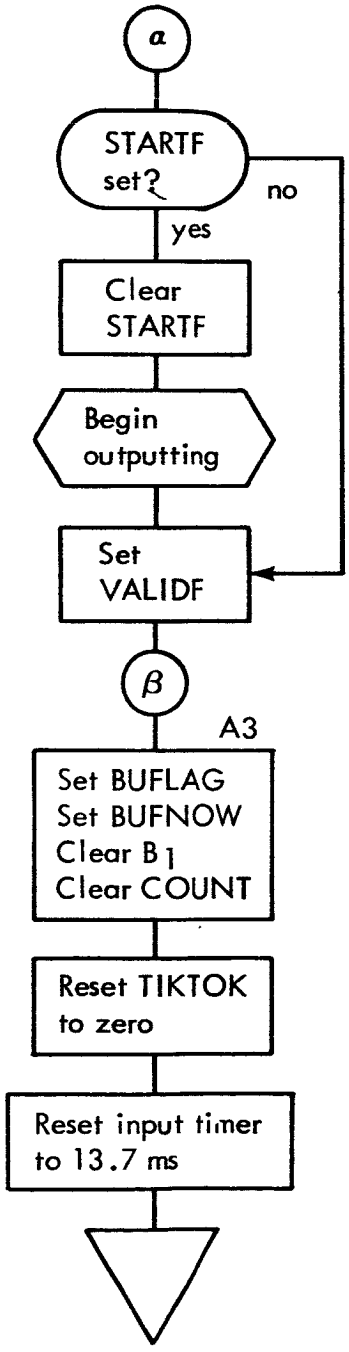


TOMCAT - IIB
Frame Gate Interrupt Processor Subroutine



Name—Input Monitor Interrupt Subroutines

Mnemonic—MINTGR, MINTGD, MINTA

Function—Initiates each section of each input buffer as the previous section fills up. Also resets input timer for each section, and when an entire buffer is full, sets the Input Monitor Interrupt Flag.

Input—Programmed Input Monitor Interrupt (generated by the computer when a previously active input buffer terminates).

Output—Initiates next section of input buffer, and resets input timer INCLOK. Also sets MINTF at end of each buffer.

Operation—There are actually three different MINT programs: MINTGR, MINTGD and MINTA, to input Gemini Real-Time data, Gemini Dump data, and Agena data, respectively. But all three work in essentially the same way, and differ only in the dimensions of their input data block.

Each frame of input data has been broken up into sections, in such a way that each section takes 12.5 ms to come into the computer. Each of these sections is timed by an input timer which is driven by the program clock TIKTOK. The timer is initially set to 7/512 second (13.7 ms); if by the end of that time the buffer section has not filled up, then it is assumed that the input from the PCM has been inhibited, and appropriate action is taken by WATCHdog. On the other hand, if data is inputting properly, then at the end of 12.5 ms, this subroutine will be entered, and among other things will reset the input timer to 13.7 ms again. Thus under normal conditions, the input timer will never run out.

Besides taking each frame into the computer in sections, each frame is taken into a buffer area different from the buffer area of the preceding frame. There are two of these input buffer areas—buffer #1 handles the odd-numbered frames, and buffer #2 the even-numbered frames. In this way, each buffer is being unloaded while the alternate buffer is being filled.

There are two counters which control the subroutine flow. The first, BUFLAG, is used to divert the subroutine to the instruction area for the particular input buffer to be filled, and the second, B-register #1 (which we call "B_1"), selects the particular section of that buffer to be initiated. Now as the reader already knows, nothing in the way of input occurs at the beginning of each pass until the first Frame Gate Interrupt is received. Then the FINT Subroutine initiates input buffer 1A (Section A of input buffer #1). Then, when

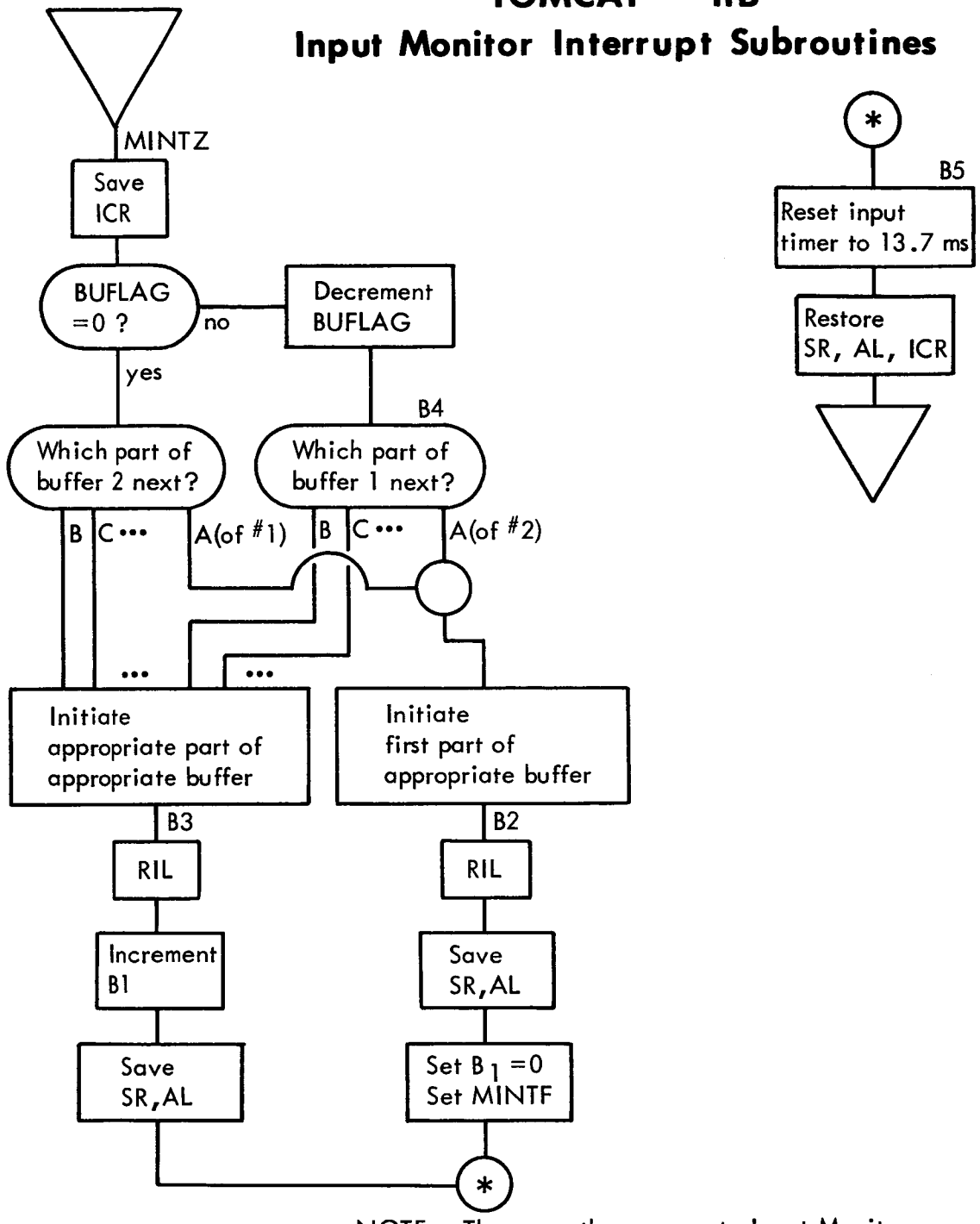
FINTP is called, among other things it sets the flag BUFNOW to "1" (this flag is discussed later), the counter BUFLAG to BUFNUM (BUFNUM had been initially set in BEGIN 2 to N = the number of sections in each input buffer) and the B-register B_1 to "0". When that buffer 1A is full, this subroutine is entered.

First it checks to see if BUFLAG is zero. If not, it decrements BUFLAG and goes to the buffer #1 instruction area; if (BUFLAG) = 0, it goes to the buffer #2 instruction area. This has the effect of sending the program to the buffer #1 instruction area N consecutive times, to initiate consecutively the remaining N-1 sections of buffer #1 and the "A" section of buffer #2. Each of these times, B_1 is used to select the particular section to be initiated next; then B_1 is incremented so as to be ready to select the following section the next time through. When all the sections of buffer #1 have been filled, B_1 selects Section A of buffer #2; then B_1 is set to "0" (so that it is ready to go through the same sequence for buffer #2 as it just did for buffer #1), and the Input Monitor Interrupt Flag MINTF is set. In the meantime of course, BUFLAG has been decremented down to zero, so that on succeeding visits to the Subroutine, it will divert control to the buffer #2 instruction area, and begin filling that up, section by section, in the way just described for buffer #1. Finally, just before exiting, the input timer is reset to 13.7 ms, to time the section just initiated.

To summarize, there are N sections in each of two input buffers. Each time the Subroutine is entered, it simply initiates the next section and resets the input timer. However, when the last section of a buffer is full, the subroutine initiates the first section of the alternate buffer, sets MINTF, and resets the timer. Thus when the Executive sees MINTF set, it knows that a complete input buffer has been filled and is hence ready to be unloaded, and it calls up the Input Monitor Interrupt Processor Subroutine MINTP.

TOMCAT- - IIB

Input Monitor Interrupt Subroutines



NOTE: There are three separate Input Monitor Interrupt Subroutines - MINTGR, MINTGD, and MINTA, for Gemini real-time, Gemini dump, and Agena, respectively.

Name—Input Monitor Interrupt Processor Subroutine

Mnemonic—MINTP

Function—Checks the validity of the just-filled buffer of data, and if found to be valid, causes it to be transferred to the output buffer. Also sets up MINT properly to input the next buffers.

Input—Frame counter COUNT, word CNTROL, flags IGNOR 1 and IGNOR 2.

Output—Sets Frame Counters COUNT and XCOUNT to (COUNT)+1. If just-filled input buffer is deemed invalid, sets the alarm sequence of flags to alarm values. Sets BUFLAG properly to divert MINT control to proper buffer instruction area. Calls appropriate LIST Subroutine to transfer data from input buffer to output buffer is data is deemed valid.

Operation—This Subroutine is called up by the Executive when EXEC observes the Input Monitor Interrupt Flag MINTF set. First, the Subroutine increments the Frame Counter COUNT and sets the frame counter XCOUNT to the incremented value of COUNT. (Two counters are used instead of one for purely historical reasons—they were necessary on TOMCAT-IIA). Then the incremented value of COUNT is examined to see if it is too large, i.e., if too many frames have come in since the last Frame Gate Interrupt. If so, alarm values are set in the alarm sequence of flags. If not, BUFNOW is examined to see whether buffer #1 or buffer #2 has just been filled. If (BUFNOW) = 1, buffer #1 is full, and BUFNOW is set to "0". If (BUFNOW) = 0, buffer #2 is full, BUFNOW is set to "1", and BUFLAG is set to "N", the number of sections in an input buffer. (This is done so that MINT will properly divert control of the buffer #1 instruction area for the next N times).

Next the control bits of the words in the just-filled input buffer are compared with those of CNTROL. If they are not identical, then besides setting alarm values for the alarm sequence of flags, the CHANGE flag is set so that the Executive will know to look for a possible change in data requirements. Finally if no indication of invalid data can be found, the subroutine calls up the appropriate LIST Subroutine to perform the actual data transfer.

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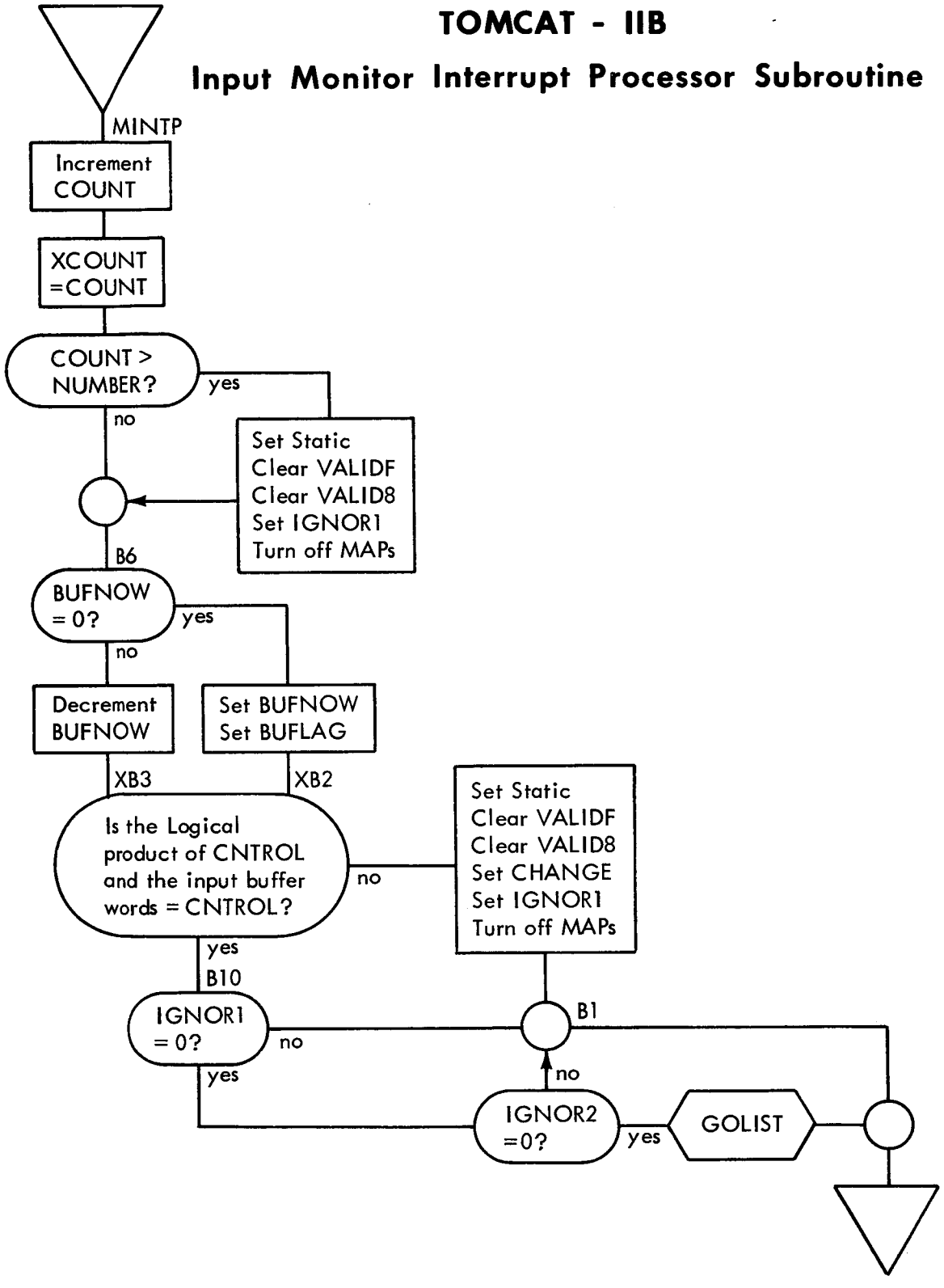
Input Monitor Interrupt Processor Subroutine



Name—Data Transfer Lists Subroutines

Mnemonic—LISTGR, LISTGD, LISTA

Function—To transfer the input data (whatever type—Gemini Real-Time, Gemini Dump, or Agena) to the proper output buffer locations. In addition, LISTGR is used to put invalid Message Acceptance Pulses (hereinafter called "MUPs") in the proper (LA01) locations in the output buffer under control of the core program.

Input—Flag FILMAP, word BUFCR, program clock BIGBEN, input data frame counter XCOUNT, and the actual input data.

Output—Input data properly stored in the output buffer. In addition, under special conditions, discussed below, there may be other outputs.

Operation—The value of the flag FILMAP, which will be either "0", "1" or "2", determines the specific function that the LIST is being asked to perform.

(FILMAP) = 2. During the Second Initialization Routine BEGIN2, FILMAP is set to "2" and the appropriate LIST Subroutine is called up. In this case, the subroutine simply initializes itself, clears FILMAP, and returns to BEGIN2. This initialization of the Subroutine consists of setting up the instructions that examine the current address of the output buffer for the purpose of determining if a 24-bit parameter is being outputted (the 24-bit parameter problem is discussed in more detail below). The initialization is accomplished quite simply by storing the address portion of the word BUFCR in each of the instruction locations mentioned. The word BUFCR is set up during BEGIN1, and contains the address of the "current address" output buffer control register for the DTU channel. That is, (BUFCR) = 41 + 2K, where K is the channel number to which the DTU is connected.

(FILMAP) = 1. When an anomaly occurs during the running of the core program and casts doubt on the validity of the data in the output buffer, FILMAP is set to "1" and the appropriate LIST Subroutine is entered. In the case of LISTGD or LISTA, the subroutine simply turns right around and exits again without doing anything (except clearing FILMAP, of course). In the case of LISTGR, however, the value 377_8 is written into all the LA01 locations in the output buffer. Then FILMAP is cleared and the subroutine is exited.

This function is used to eliminate the potentially dangerous condition which would occur if for some reason the output buffer data were to become static (unchanging) with valid Message Acceptance Pulses (hereinafter called simply

"MAPs"), 000_8, in the LA01 locations. The Digital Command System (DCS) interprets such a MAP (000_8) as a guarantee that its previous command has been received and implemented by the spacecraft. For this reason, every practical precaution must be taken (1) to guarantee transmission of every MAP received, and (2) to avoid sending a MAP when in fact one has not been received. Requirement (1) is discussed in more detail later on. Requirement (2) is the condition which the present function obtains. That is, as soon as some anomaly occurs to compromise the validity of the data in the output buffer, the core program sets (FILMAP) = 1, and calls up this LIST Subroutine. This Subroutine then stores MUPs (377_8) in the LA01 locations in the output buffer, thus guaranteeing that MAPs (000_8) will not be transmitted erroneously.

(FILMAP) = 0. This is the "normal" value for FILMAP, used when the LIST is being called upon to perform its normal function of transferring data from the input buffer to the output buffer. To accomplish this, the frame counter XCOUNT is entered into a B-register and an indirect addressing scheme is used to jump to the particular Data Transfer List which corresponds to the particular input frame just received. Then the actual data transfer takes place and the subroutine is exited. The construction of the Data Transfer Lists was simplified by analyzing carefully all recurring patterns in the input data stream, so as to take advantage of any redundancies which do occur. This analysis is given in some detail in an earlier volume (Volume III). Otherwise, the coding is quite straightforward, with the exception of the four following special problems.

LA01. As mentioned above, it is a prime requirement that the program guarantee the transmission of all MAPs received, insofar as practical. Two special techniques are employed to do this. First, if the value of the parameter LA01 received in the input data train is not either definitely a MAP (000_8) or a MUP (377_8), then some method must be employed to assign either one value or the other, as MAPs and MUPs are handled differently. The method used here is a bit-counting scheme. The subroutine examines the seven most significant bits of the parameter (i.e., bits 2^7 through 2^1 of the actual input word), and assigns the value 000_8 (MAP) to the word if fewer than four of these bits are "1's", and the value 377_8 (MUP) if four or more of these bits are "1's".

Secondly, it is necessary to insure that when a MAP is placed in the output buffer, it remains there at least 28 ms. This is the maximum time difference between readout by the DTU of successive LA01 locations. Thus by causing each MAP to remain this long we can guarantee that it will be read out at least once. Since the time period between data transfers of consecutive input frames is less than 28 ms (in fact, it is 25 ms), it is necessary that any MAP which is placed in the output buffer during one data transfer, remain there at least until

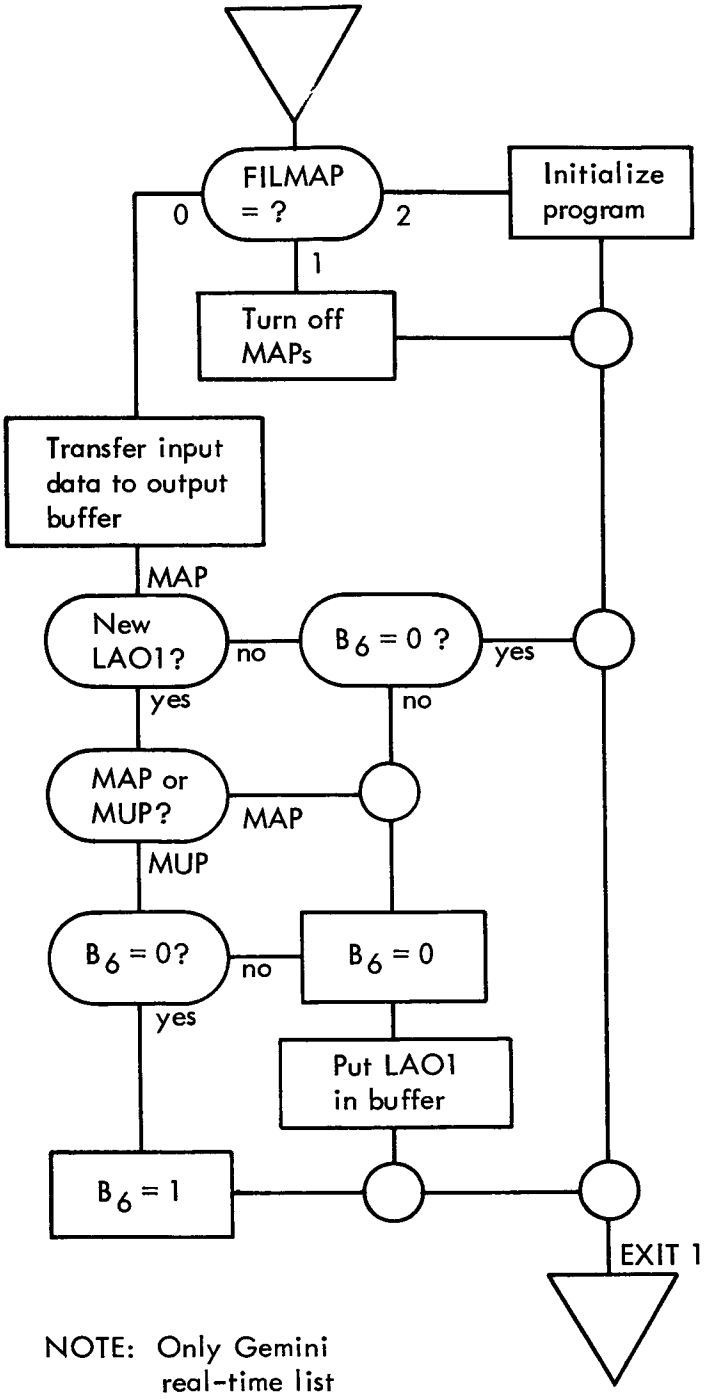
the second following data transfer. In this way, it will be at least 50 ms until it is written over, and thus the DTU will be certain to see it.

AA01. This parameter is the least significant syllable (LSS) of the 24-bit parameter AA02 (Spacecraft Elapsed Time, or SET). Besides being stored in its assigned locations in the output buffer, AA01 is also written directly into the LSS of AA02, so that the SET will be up-to-date when received.

AA03. This parameter is the spacecraft Tr (Time-to-Retrofire) clock. Since this parameter is received only once in every 2.4-second input frame, it is not being continuously updated. As some time will elapse between the time the parameter is transferred to the output buffer and the time it is finally read out by the DTU, the parameter is likely to be incorrect when finally transmitted. To correct this situation, the parameter is time-tagged when it is transferred to the output buffer, by storing the current program time BIGBEN in the location TIMET at the time of transfer. When the DTU is ready to read the Tr out, it notifies the core program, which brings in the current value of BIGBEN, subtracts TIMET, and thus determines how long the Tr has been sitting in the output buffer. Subtracting this time difference from AA03 gives the true time-to-retrofire, which is then read out by the DTU as the true (up-to-date) value of AA03.

All 24-bit parameters. Steps are taken to assure the integrity of all 24-bit parameters when transmitted. The difficulty could naturally arise that this Subroutine would transfer a 24-bit parameter to its three consecutive locations in the output buffer at the same time that the DTU was engaged in sending that parameter out (it takes the DTU 8 ms to read out all three syllables of a 24-bit parameter). If this occurred, the DTU would actually transmit the first one or two syllables of the old parameter, and the last syllables of the new parameter, and of course these may not be compatible. To avoid this, the subroutine looks at the current address of the word next in line to be outputted, and compares that address with the locations in which the subroutine intends to store the 24-bit parameter. If they match, the Subroutine does not store the parameter in the output buffer, but instead, stores it in a temporary holding area, and sets a flag which will cause the parameter to be stored in its proper locations at the time of the next data transfer, 25 ms later (by which time, of course, the DTU will have finished reading out the old parameter).

TOMCAT - IIB
List



NOTE: Only Gemini real-time list contains MAP logic.

Name—Output Monitor Interrupt Subroutines

Mnemonic—MOUTGR, MOUTU

Function—Initiates each output buffer when the previous buffer is emptied. Also validates those output buffers which contain guaranteed valid data, sets a time limit on each buffer so that the WATCHdog will be notified if the DTU hangs up, and takes care of bringing the entire program to an orderly halt at LOS. In addition, the MOUTGR Subroutine corrects the parameter AA03 (time-to-retrofire) for the time it spent sitting in the output buffer, just before sending it out.

Input—Flags LOSF, VALIDF, VALID 8

Output—The next output buffer is initiated with correct values in the Status Word (Slot 5), and (in the case of MOUTGR) an updated value in AA03, and the output timer is set. In addition, if LOS has occurred, a sequence is initiated which will eventually bring the computer to an orderly halt.

Operation—There are two Output Monitor Interrupt Subroutines—MOUTGR (for processing Gemini Real-Time data) and MOUTU (a Universal model, used for Gemini Dump and Agena data processing). They differ only in that MOUTGR contains provisions for pausing twice during the outputting of the buffer to correct the Tr for the time it spent in the computer waiting to be sent out.

The Subroutine is entered upon occurrence of a programmed Output Monitor Interrupt (generated by the computer when a previously active output buffer terminates). First, the output timer is reset. This timer was initially set to 2 1/8 seconds; if by the end of that time the buffer has not been emptied by the DTU (a process which should take exactly 2 seconds), it is assumed that the DTU has hung up, and appropriate action is taken by WATCHdog. On the other hand, if data is outputting properly, then at the end of 2 seconds, this Subroutine will be entered and (among other things) will reset the output timer again. Thus under normal conditions, the output timer will never run out.

Secondly, the flag LOSF is examined. This flag will be set by WATCHdog when it detects Skip Key Ø turned on and off (at LOS). Hence if (LOSF) = 0, LOS has not occurred, and the Subroutine simply jumps around the next block of instructions. If (LOSF) = 1, however, then the program must be brought to an orderly halt, by sending out one last output buffer of data and then shutting down. To accomplish this an internal flag, LOS1F (which was set to "0" in BEGIN 1), is now examined. The first time through (when LOSF is first found to be "1"), LOS1F will still be "0", and is set to "1", so that the second time through, the

Subroutine will know that the final output buffer has been sent out and the computer can be shut down. That is, if (LOS1F) = 1, the Subroutine locks out interrupts, sets up the initial AU and AL register settings (see Note 3' of the Operating Instructions), and comes to a normal Stop 5 with P = 5000. If (LOS1F) = 0, the Subroutine sets LOS1F to "1", and sets Bit 7 of the Message Label in Slot 4 of the output buffer (the "last frame" indicator), to alert the receiver that the program is sending its final buffer and is about to shut down.

Thirdly, the flag VALIDF is examined. If this flag is "0", no action is taken, and the Subroutine simply jumps to the next block of instructions. If (VALIDF) = 1, however, it means that the input data, which for one reason or another had been invalid for a while, has now become good. That is, the output buffer had up until now been deemed invalid, but it now contains all valid data. Hence the buffer must be validated, by changing the Status Word in Slot 5 of the output buffer. But since the Status Word reports on the previous buffer, it must not be changed right away, but instead must be changed the next time through this sequence, after the next buffer (which will be completely valid) has been sent.

To accomplish this, if (VALIDF) = 1, it is set to "0" and the flag VALID 8 is set to "1". If (VALIDF) = 0, however, then VALID 8 is examined. Then if (VALID 8) = 0, no action is taken. If (VALID 8) = 1, however, it is set to "0" and the Status Word is changed to the valid data indicator.

Finally, the next output buffer is initiated, and the Subroutine exits.

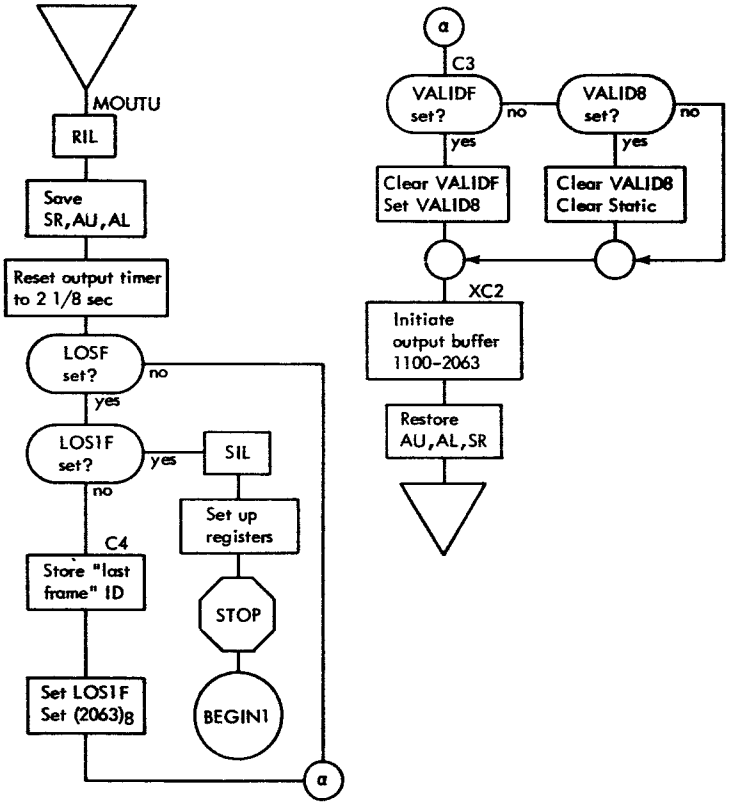
Only one change is made to this sequence to accommodate the updating of the Tr in the MOUTGR model of this Subroutine. The Tr (parameter AA03) occurs in two places in the output buffer, in Slots 69-71 and in Slots 319-321. At the end of the above sequence, when the output buffer is initiated, it is set only to output the words through Slot 68, and an internal flag, WHICH 1, is set to "1". Thus when the Output Monitor Interrupt occurs, and this Subroutine is entered, WHICH 1 is examined. Hence if (WHICH 1) = 1, the Subroutine knows that it is about to output the Tr from Slots 69-71, and therefore this parameter must be updated to account for the time that it has been sitting in the output buffer. To do this, the Subroutine FIXTR is called up.

This FIXTR Subroutine picks up the current program time (BIGBEN), and subtracts from it the contents of the word TIMET. This word TIMET was set by the LISTGR Subroutine to the then-current value of BIGBEN, at the time the parameter AA03 was placed in the output buffer. The difference (DELTAT) between (BIGBEN) and (TIMET) therefore is precisely the time interval (in eighths of a second) that the Tr has been sitting in the output buffer. This difference is

therefore subtracted from AA03 to arrive at a new value which represents the true time-to-retrofire. This new value is put into the output buffer at Slots 69-71 and Slots 319-321, and the current program time (BIGBEN) is then put in TIMET, to become the new reference time from which future updatings are made. The FIXTR then exits back to MOUTGR, which then sets (WHICH 1) = 2, initiates the next output buffer from Slot 69 to Slot 318, and exits.

The next Output Monitor Interrupt will cause MOUTGR to be entered, and the Subroutine will find (WHICH 1) = 2. Then it will call up FIXTR to update the parameter, set (WHICH 1) = 0 and initiate the last part of the output buffer, from Slot 319 to Slot 500. When the following Output Monitor Interrupt occurs, with (WHICH 1) = 0, the Subroutine will enter the sequence first described.

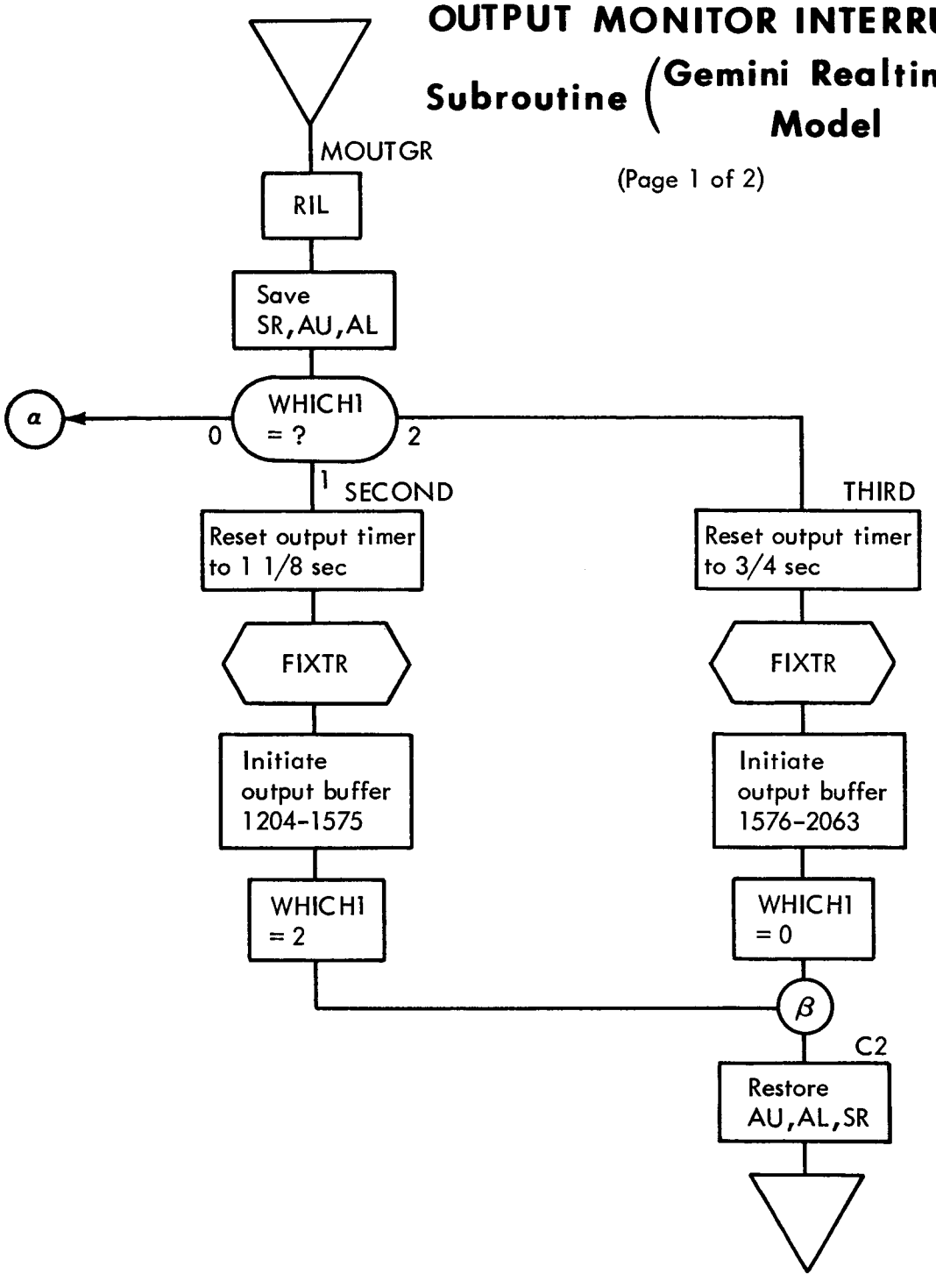
TOMCAT - IIB
Output Monitor Interrupt
Subroutine (Universal Model)



NOTE: This Universal Model of the Output Monitor Interrupt Subroutine is used in the Gemini dump and Agena processing modes.

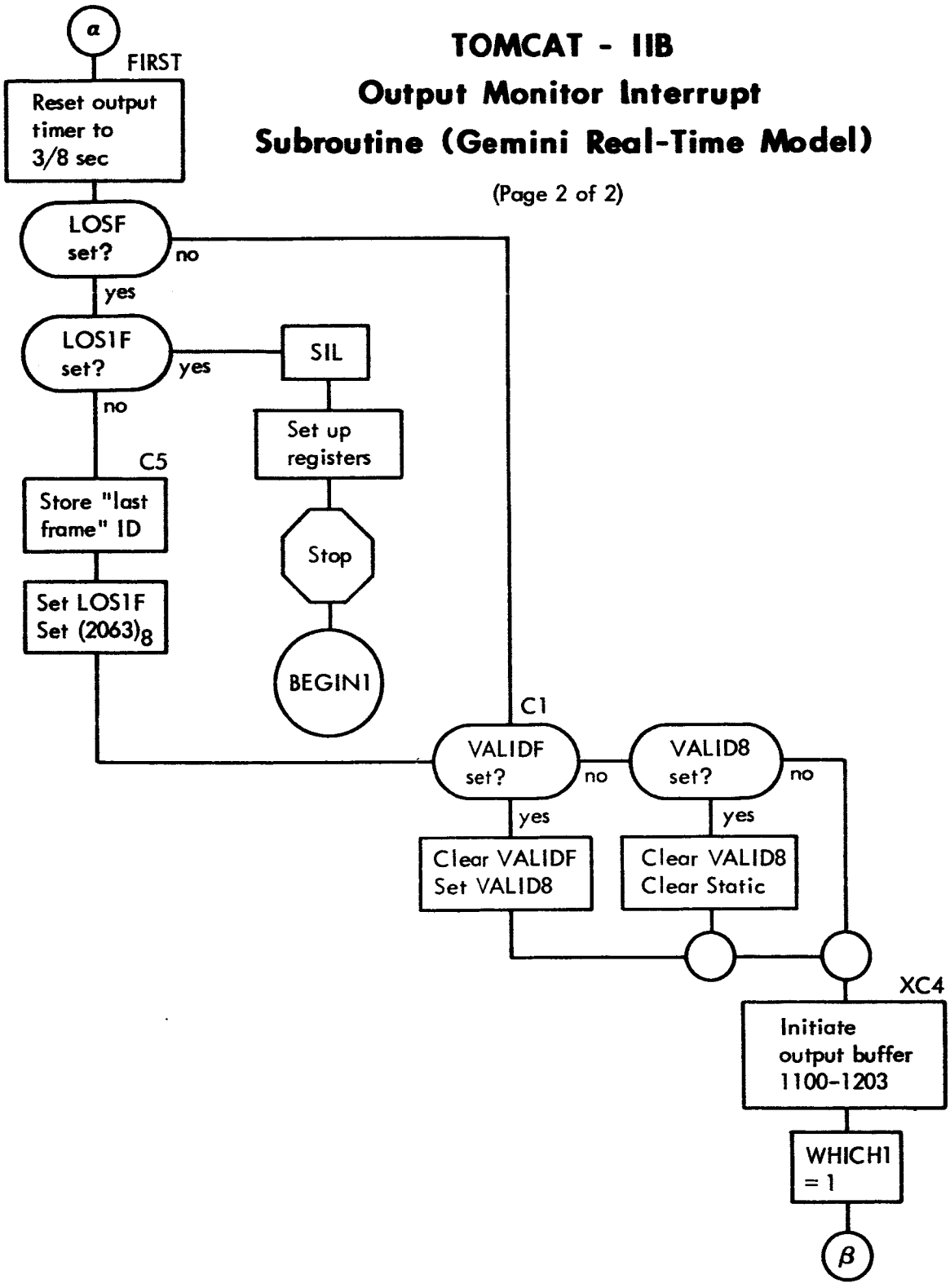
TOMCAT - IIB
OUTPUT MONITOR INTERRUPT
Subroutine (Gemini Realtime Model)

(Page 1 of 2)



TOMCAT - IIB
Output Monitor Interrupt
Subroutine (Gemini Real-Time Model)

(Page 2 of 2)



Name—WATCHdog Subroutine

Mnemonic—WATCH

Function—To monitor the Skip Key settings and the input and output timers, and take appropriate action if any of the Skip Key settings is changed, or if either the input or output timer has run out.

Input—Skip Keys ∅, 2, 3, and 4; flags GEMINI, REAL and PLAYB; input timer INCLOK and output timer TIMER.

Output—Flags GEMINI, REAL, PLAYB, LOSF, CHANGE and SWITCH; word CNTROL. Also various actions are taken if any anomalies were discovered.

Operation—The Subroutine is called up once during each circuit of the Executive Loop. First, the Subroutine checks Skip Key ∅. If "off", no action is taken. If "on", then LOS has occurred, and hence the Subroutine sets LOSF and sets alarm values in the alarm sequence of flags.

Secondly, the Subroutine checks Skip Keys 2 and 3, to see if either setting has been changed from its position the last time it was checked. Skip Key 2 is "off" for Gemini, "on" for Agena. The previous setting is given by the flag GEMINI ("1" for Gemini, "0" Agena). If the setting has been changed, the flag GEMINI is changed to conform to the new setting, and the flags CHANGE and CHNGE 1 are set. Skip Key 3 is "off" for real-time data, "on" for dump data (spacecraft dump). The previous setting is given by the flag REAL ("1" for real-time, "0" for dump). If the setting has been changed, the flag REAL is changed to conform to the new setting, and the flags CHANGE and CHNGE 1 are set. Thus at the end of this sequence, GEMINI and REAL have been set to specify the current settings of Skip Keys 2 and 3, and in addition, if either or both of these settings have been changed since the last time they were observed, the flags CHANGE and CHNGE 1 are set.

Now CHNGE 1 is observed. If it is "0", no action is taken. If it is "1", then it is turned off, and the word CNTROL is set to the Data Control Bit of the new kind of data called for by the Skip Key settings. Furthermore, alarm values are set for the alarm sequence of flags, and the flags NODATF and NODATG are reset to their initial values.

Next, the input timer INCLOK is examined to see if time has run out, i.e., if it has taken too long for the current section of input buffer to come in. The timer itself works in a very simple way. The timer is "set" each time by

writing the time it will be when the time limit is up. For instance, in this application, the current program time (TIKTOK) is brought in, incremented by 8, and stored in INCLOK. Thus the timer will have "run out" when the current program time (TIKTOK) advances to the value in INCLOK. This will occur sometime between 7/512 and 8/512 of a second later (the uncertainty is due to the granularity of the clock, which is 1/512 second). Thus the timer will be running for at least 7/512 second (which is 13.7 ms) from the time it was set. This is plenty of time for a section of input buffer to come in.

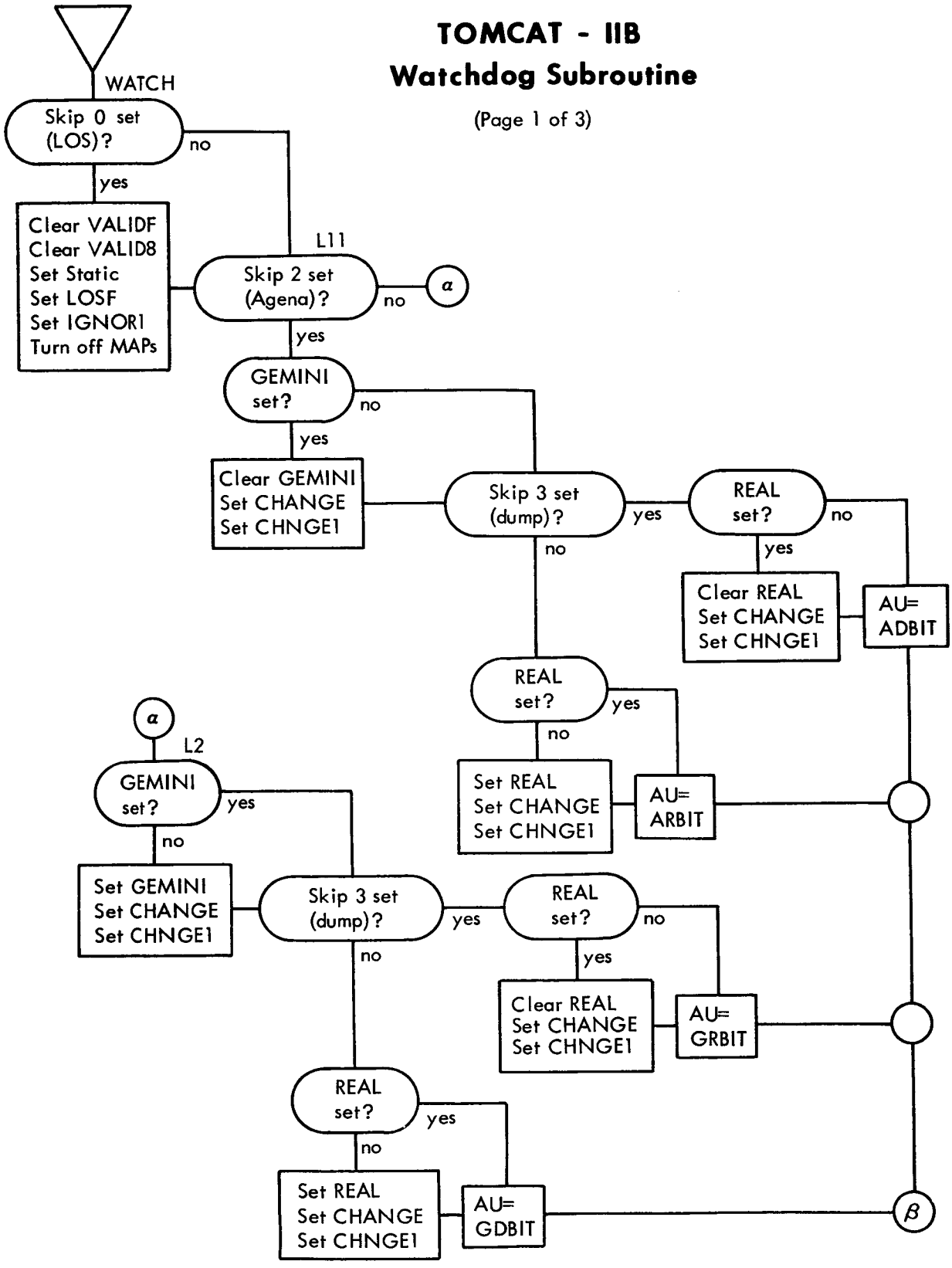
If the time is not up, i.e., if (INCLOK) > (TIKTOK), then no action is taken, and the Subroutine simply jumps around the next block of instructions. If the time is up, however, it means that the input has been inhibited. There are two possible reasons for this. Either the PCM is simply out-of-sync, or it has actually been inhibited manually (perhaps to change to the other channel). In either case, alarm values are given to the alarm sequence of flags, and a one-word buffer is initiated on the alternate channel. A 1.95 ms timer is started, and the Subroutine waits. If the time runs out before a word comes in, the alternate-channel buffer is terminated, the input timer is reset to 13.7 ms and the Subroutine jumps to the next area. If a word comes in before the timer runs out, its control bits are checked. If they do not conform to the values specified in CNTROL, the input timer is reset to 13.7 ms and the Subroutine jumps to the next area. On the other hand, if a word comes in on the alternate channel which has the proper control bits, then the Subroutine causes the program to change channels and set up to process the data from the alternate channel. It accomplishes this by interchanging the values of CHANNL and NCHANL, setting the SWITCH flag, and exiting directly to BEGIN 2 to reinitialize the program to input on the new channel.

Next, the Subroutine checks the output timer TIMER. If it has not run out, no further action is taken, and the Subroutine simply jumps around the next block of instructions. If the timer has run out, however, it means that the DTU has hung up (this is a sporadic hardware problem that the program must be able to accommodate). The Subroutine then sets alarm values for the alarm sequence of flags, except that it does not turn off the MAPs in the output buffer (because the data transfer has not ceased, but has been continuing to renew the data). Then the DTU is turned on again and the output timer is reset.

Lastly, Skip Key 4 is examined. This key is "off" for live data (direct from the spacecraft), "on" for tape playback (from the PCM tape deck). The previous setting is given by the flag PLAYB ("0" for live, "1" for tape playback). If the setting has been changed, the flag PLAYB is changed to conform to the new position, and alarm values are given to the alarm sequence of flags, except that the flag IGNOR 2 is set instead of the usual alarm flag IGNOR 1 (the further use of this flag is described in the explanation of the Subroutine FINTP). Then the Subroutine exits.

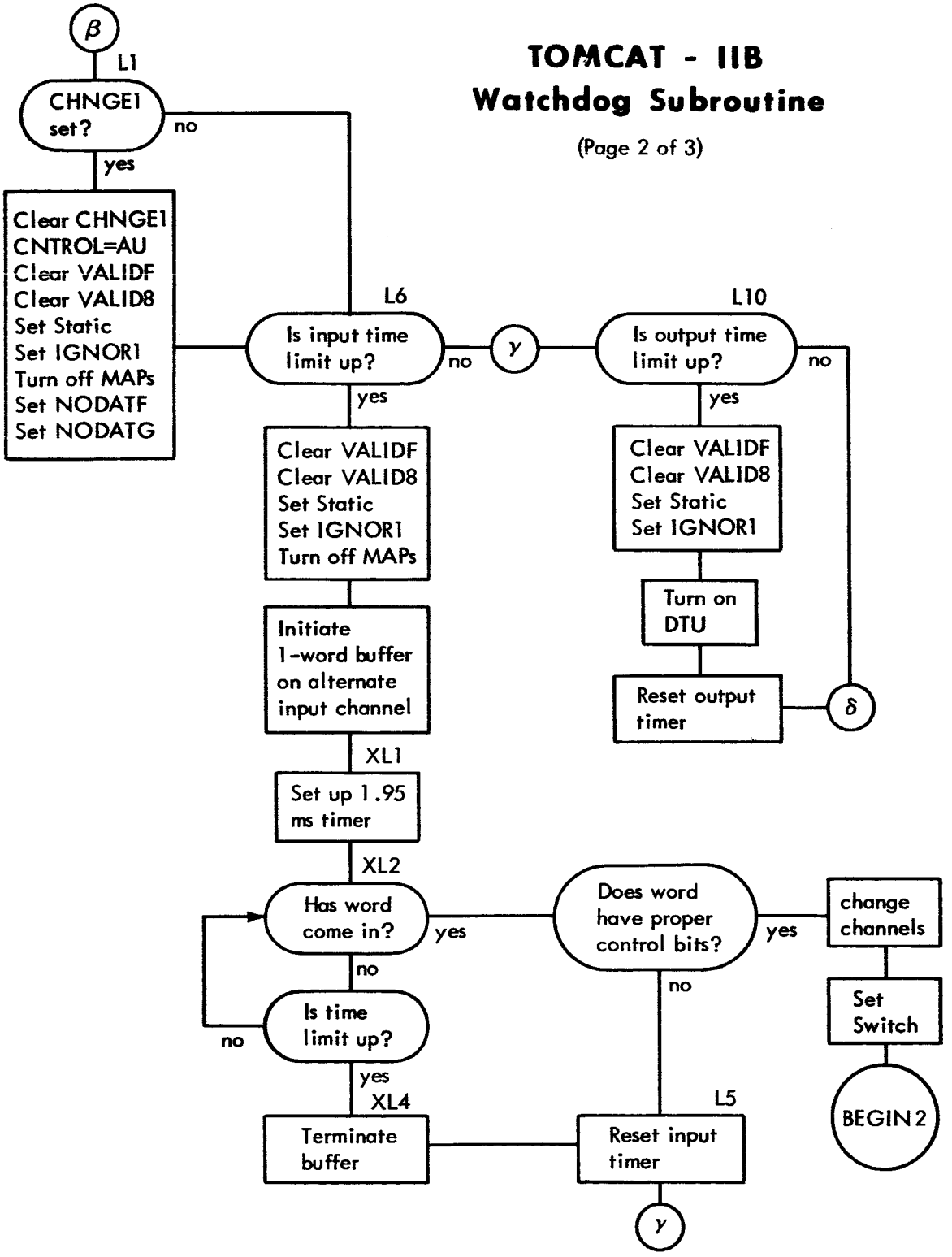
TOMCAT - IIB
Watchdog Subroutine

(Page 1 of 3)



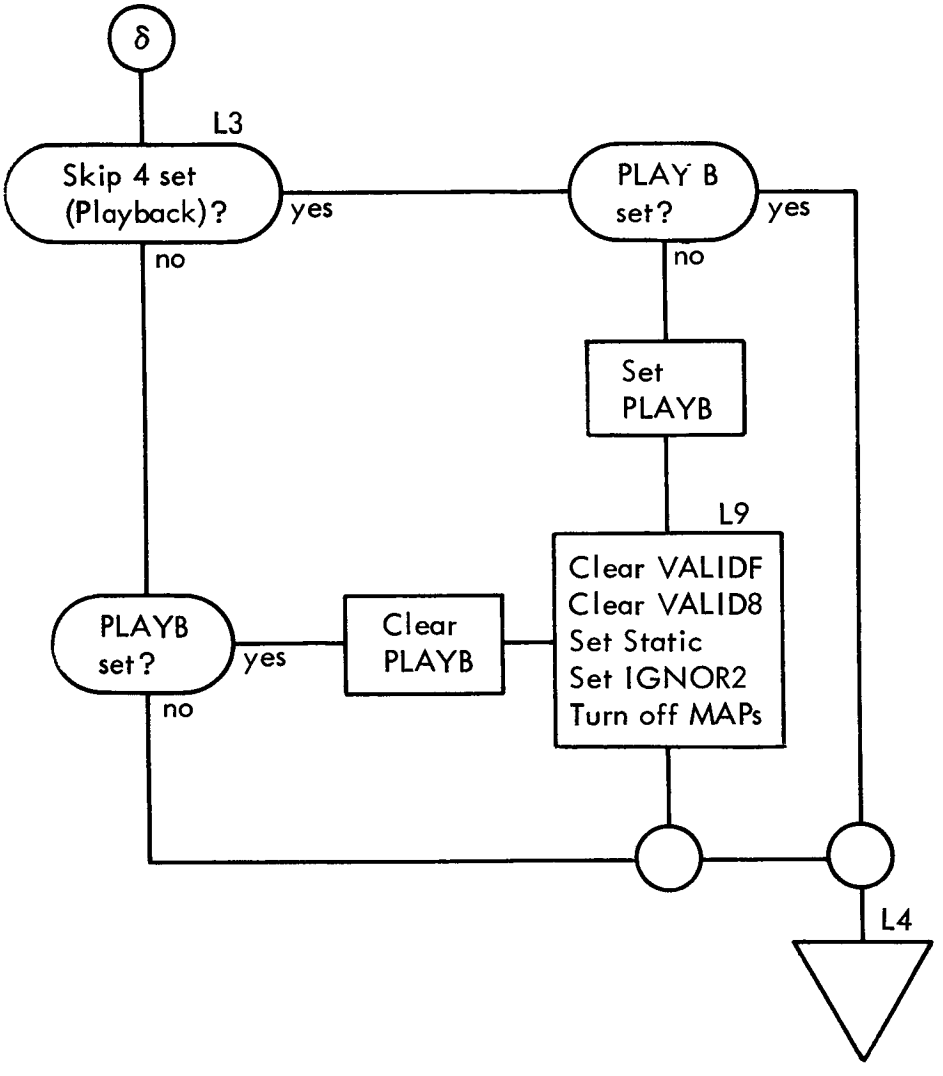
TOMCAT - IIB
Watchdog Subroutine

(Page 2 of 3)



TOMCAT - IIB
Watchdog Subroutine

(Page 3 of 3)



SPECIAL FEATURES

Alarm Sequence

Most of the flags used in the program have either an obvious function which can be understood immediately, or an obscure function which can be understood only by studying the subroutine involved. There is one group of flags, however, called the "alarm sequence", whose use throughout the program is so widespread that it deserves special explanation.

There are many conditions which, when they obtain, cast doubt on the validity of the data in the output buffer. Among the more obvious are that the input data train is too long or too short, the wrong kind of data is present in the train, the PCM or DTU is hung up, some of the skip keys are changed, etc. When any of these conditions occurs, then, it is necessary immediately to invalidate the output buffer. At a later time, when the data becomes valid again, then it is naturally required to re-validate the output buffer. For these purposes, the alarm sequence of flags is used. These include the alarm flags IGNOR 1 and IGNOR 2, the status flag Static, and the validating flags VALIDF and VALID 8. When any compromising condition occurs, the following actions are taken:

(1) The validating flags VALIDF and VALID 8 are immediately turned off. The MOUT Subroutines use these flags to validate the output buffer; hence if they happened to be on, it is imperative that they be turned off immediately. For if this were not done (say, e.g., the program first invalidated the output buffer and then later turned off these flags), it could happen that in the interim, MOUT would come along, see the flags set, and re-validate the buffer. Thus it would end up valid, not invalid as required.

(2) The flag Static is set. This is the out-of-sync (invalid) Status Work in the output buffer.

(3) One of the alarm flags is set. It will almost always be the "general" alarm flag IGNOR 1. The sole exception occurs in WATCHdog when Skip Key 4 is found to be changed from its previous setting; in this case, IGNOR 2 is set instead of iGNOR 1. This is done so that FINTP will know to change the Message Label in Slot 4 of the output buffer to conform to the new input.

(4) In the event Gemini Real-Time data is being processed, MUP patterns (377_8) are stored in all of the LA01 locations in the output buffer. This is done to prevent the DCS from seeing "stale" valid MAPs which

might happen to be present when the input hangs up (and would hence continue to be transmitted in the absence of new values being transferred into the buffer).

Now when FINTP sees one (or both) of the alarm flags set, it first clears them (so that they will be ready to report on the validity of the next cycle) and then sets the flag IGNORF. Thus when FINTP is again entered 2.4 seconds later, it can determine whether the cycle prior to the just-completed cycle was invalid. In this way, if both alarm flags are clear and IGNORF is set, FINTP knows that an entire cycle of valid data has come in and replaced the previously invalid data in the output buffer. Hence from then on, the output buffers will be valid.

To validate them, FINTP sets the validating flag VALIDF. When MOUT sees this flag, it then knows that the next buffer it sends out will be valid. So it clears VALIDF and sets the other validating flag VALID8. The next time through, then, when MOUT sees VALIDF clear and VALID8 set, it knows that it has just finished sending out the first valid output buffer following a sequence of invalid buffers and hence it turns off the Static flag (it sets the Status Word to "valid"). From then on, until another compromising condition occurs, the output buffers will be labeled "valid".

Timing Considerations

As in most real-time situations, there are some critical timing relationships which must be kept in mind. There are several of these.

One of the less crucial relationships revolves around the fact that two alternate input buffers are used to input the data. Thus it is necessary to complete the data transfer from one buffer in the time it takes the other to fill up. As this is a minimum of 25 ms, there is actually plenty of time to take care of this. However, in future editions of the program it may be necessary to consider this relationship more carefully.

Another minor problem is occasioned by the fact that the receiving hardware uses a time-dependent stripper to remove data from the stream. Thus it is important to keep feeding the DTU with data. As the DTU works at a rate of 4 ms/word, this requirement means that succeeding output buffers must be initiated within 4 ms of the termination of the previous one. Again, this presents no problem in the current edition of the program, but should be kept in mind as future editions are developed.

A third timing relationship is a true problem, even in the current program. It involves the minimum time interval between input words in the data stream.

This minimum occurs in the Gemini stream—at a telemetry transmission rate of 51.2 KBS (6400 words/sec) the time between words is only 156us. Of course, the computer does not see every word, and even if it did, the fully buffered input does not require attention until the termination of a buffer. But nevertheless, two problems arise. The first, naturally, is that after one section of input buffer is terminated. the next section must be initiated within 1.56 ms (time between the 74th word of one frame and the 4th word of the next). This is, of course, no problem at all. The other problem is that between occurrence of a Frame Gate Interrupt (signaling the beginning of a new 2.4-second data cycle) and the arrival of the first input data word, there is only 156us, because the sync words immediately precede the first data word.

To study this problem, it is necessary to keep track of all places in the program when interrupts are locked out. (Of course, we are only concerned with the problem when the program is actually processing, not during initialization). These areas are in the interrupt subroutines FINT, MINT, MOUT and CLOCK, and in L 8 of LISTGR (when the 24-bit parameter AA03, time-to-retrofire, is being handled). This latter area, however, need not be considered, since it is entered immediately after the first section of the ninth input buffer of the cycle is initiated, and hence there is 12.5 ms available before the next section is to be initiated. This might not obtain in future editions of the program, however, hence the following analysis would not be valid.

During the time between occurrence of a Frame Gate Interrupt and arrival of the first data word, we must allow for an Output Monitor Interrupt (12us), a Synchronizing Interrupt (12us), and the initiation of the first section of the first input buffer following the Frame Gate Interrupt (28us). We do not need to allow for the time required to finish a current instruction, since the External Interrupt has priority over the Output Monitor Interrupt. Hence the buffer will be initiated within 52us of receipt of the Frame Gate Interrupt, well in advance of the arrival of the first data word. An Input Monitor Interrupt need not be allowed for, since this will occur after the 74th word in the last frame of the cycle, leaving plenty of time to service the interrupt before the Frame Gate Interrupt can occur (after the third word of the following frame).

There is one further problem which does not trouble the current program, but which must be considered in the future. This is the absolute necessity of avoiding the stacking of interrupt servicing. In plain language, each interrupt must be serviced before the next one arrives. Otherwise insuperable problems will occur—in particular, the return address of an interrupt subroutine could be obliterated by answering the next interrupt before exiting the interrupt subroutine from the last one. The only subroutine where this is a clear and present danger is the CLOCK, which must answer the Synchronizing Interrupt every

977 us. In the present program, even if all interrupt subroutines are stacked and the lockout in L 8 of LISTGR is allowed for, there is no possibility of this catastrophe actually materializing. However, in future editions this might not be the case. In particular, if any functions are added to MOUT (e.g., to solve the on-board computer parameter problem), the problem could well reappear. There are at least two ways that one might consider to avoid it. One would be to leave the interrupts locked out throughout the entire CLOCK Subroutine. This would unfortunately add 94 us to the 12 us given before, which brings the 52 us mentioned earlier to 146 us leaving a very marginal 10 us to initiate the first section of input buffer. The other solution would be to put noncritical functions to be done at output monitor interrupt time in a separate Output Monitor Interrupt Processor Subroutine MOUTP, using an Output Monitor Interrupt Flag MOUTF to require the Executive to call this subroutine. Were this to be done, some of the functions presently performed in the MOUT Subroutines could be moved to this Processor.

Programming Techniques

Most of the programming is quite straight forward. The use of circuitous instruction sequences and sophisticated instruction modification has been purposely kept to a minimum. However, we will include here a note about the assignment of symbolic addresses since there are some patterns we can point out which will be of assistance to the programmer with the task of modifying this program to meet future requirements.

Firstly, we have assigned each routine or subroutine a characteristic letter, according to the following table:

Characteristic Letter	Subroutines Where Used
A	FINT, FINTP
B	MINTGR, MINTP
C	MOUTGR, MOUTU
D	MINTGD
E	SEARCH
F	NODATA
H	BEGIN 1
J	CLOCK
L	WATCHdog
M	BEGIN 2

Then whenever a symbolic location in a subroutine is assigned, the characteristic letter is used. E.g., the symbolic addresses in CLOCK (aside from CLOCK itself) are J1, J2, and JSRSAV. In this way, we avoid assigning any of these addresses in other subroutines, and hence we reduce the chance of assembly error. Besides using the characteristic letter, we have called all places where we store the contents of the Special Register "SRSAV"—e.g., JSRSAV, ASRSAV, etc., and all places where we store the contents of the Index Control Register "ICRSV"—BICRSV, DICRSV, etc. Furthermore, most of the locations which require address modification during initialization are preceded by an X—XM1, XM2 and XM4 in BEGIN2, for instance.

In addition to the use of characteristic letters, we have attempted to use straightforward mnemonics for those addresses which begin a block of instructions with a specific purpose. Thus, e.g., FIXGEM and FIXAG for "Fix Gemini" and "Fix Agena" in BEGIN2, XCHECK and YCHECK for "Check Channel X" and "Check Channel Y" in SEARCH, etc.

Finally we have collected all the program constants, variables and storage locations in one block, beginning with FILMAP. Some of the meanings of the mnemonics are obvious, others somewhat obscure. In the interest of completeness, however, we provide the following list:

Mnemonic	Original Meaning
ABUF	One less than the number of words in Agena input buffer
ADBIT	Agena Dump Data Control Bit
ADID	Agena Dump ID Label
ALIST	Address of Agena LIST
ALSAVE	Save AL
ALSAV1	Save AL #1
ALSAV2	Save AL #2
ALSAV3	Save AL #3
ANUM	Number of Agena frames per cycle
APART	Number of parts (sections) in Agena input buffer

Mnemonic	Original Meaning
ARBIT	Agena Real-Time Data Control Bit
ARID	Agena Real-Time ID Label
ASYNC	Agena Sync Pattern
AUSAVE	Save AU
AUSAV2	Save AU #2
A1AE	Agena buffer #1, Section A, ending address
A1S	Agena input buffer #1 starting address
A2S	Agena input buffer #2 starting address
BIGBEN	Big Ben
BIT 7	Bit 7
BIT 8	Bit 8
BIT 13	Bit 13
BUFCR	Buffer Control Register
BUFLAG	Buffer flag (tells which buffer to fill)
BUFNOW	Buffer now (current buffer)
BUFNUM	Number of sections in buffer
CELLB	Cell B
CELLC	Cell C
CHANGE	Change kind of data
CHANLX	Channel X
CHANLY	Channel Y

Mnemonic	Original Meaning
CHANNL	Input Channel
CHNGE 1	Change kind of data
CLOCKJ	RJP to CLOCK Subroutine
CLOCK 1	Input clock (timer)
CNTROL	Control bits
COUNT	Frame Counter
DATAOK	Output data is O. K. (valid data indicator)
DELTAT	Delta t (Δt)
EINS	Eins ("One" in German)
FDMASK	Field data code mask
FILMAP	Fill MAP locations (with MUPs)
FINTF	Frame Gate Interrupt Flag
FINTJ	RJP to FINT Subroutine
GDBIT	Gemini Dump Data Control Bit
GDBUF	One less than the number of words in Gemini Dump input buffer
GDID	Gemini Dump ID Label
GDLIST	Address of Gemini Dump LIST
GDNUM	Number of Gemini Dump frames per cycle
GDPART	Number of parts (sections) in Gemini Dump input buffer
GD1AE	Gemini Dump buffer #1, Section A, ending address
GEMINI	Gemini

Mnemonic	Original Meaning
GOLIST	Go to the appropriate LIST
GRBIT	Gemini Real-Time Data Control Bit
GRBUF	One less than the number of words in Gemini Real-Time input buffer
GRID	Gemini Real-Time ID Label
GRLIST	Address of Gemini Real-Time LIST
GRNUM	Number of Gemini Real-Time frames per cycle
GRPART	Number of parts (sections) in Gemini Real-Time input buffer
GR1AE	Gemini Real-Time buffer #1, Section A, ending address
GSYNC	Gemini sync pattern
G1S	Gemini input buffer #1 starting address
G2S	Gemini input buffer #2 starting address
HOLDIT	Hold it (storage location)
ICRMSK	Index Control Register mask
IGNORF	Ignore data flag
IGNOR 1	Ignore data #1
IGNOR 2	Ignore data #2
INCLOK	Input Clock (input timer)
LOSF	LOS flag
LOS1F	LOS flag
MAPPAT	MAP pattern
MASK 1	Mask #1

Mnemonic	Original Meaning
MASK 2	Mask #2
MASK 3	Mask #3
MINJA	RJP to Agena MINT Subroutine
MINJGD	RJP to Gemini Dump MINT Subroutine
MINJGR	RJP to Gemini Real-Time MINT Subroutine
MINTF	Input Monitor Interrupt Flag
MINTJ	RJP to appropriate MINT Subroutine
MOUJGR	RJP to Gemini Real-Time MOUT Subroutine
MOUJU	RJP to Universal MOUT Subroutine
MOUTJ	RJP to appropriate Output Monitor Interrupt Subroutine
MUP	Invalid MAP (Message "Unacceptance" Pulse)
NCHANL	Not the Input Channel
NODATF	No data flag
NODATG	No data flag
NUMBER	Number of frames per cycle
PATTRN	Fill pattern
PLAYB	Tape Playback
PUTRIL	Put RIL (in interrupt entrance register)
REAL	Real-Time
SAFETY	Safety
SAVE	Save (storage location)

Mnemonic	Original Meaning
STARTF	Starting flag
STATIC	Static data indicator
STORAL	Store AL
STORAU	Store AU
SWITCH	Switch channels
TEMP	Temporary storage locations
TIKTOK	Tick-tock
TIMER	Output timer
TIMET	Time Tag
VALIDF	Valid data flag
VALID8	Validate output buffer ("8" = "ate" - Get it?)
WHICH1	Which 1 ("which one?" - Get it?)
XBUF	Channel X buffer
XCOUNT	Frame Counter
XDTUON	Turn on the DTU
XFLAG	Channel X flag
XOFFPR	Turn off the printer
XONPR	Turn on the printer
YBUF	Channel Y buffer
YDTUON	Turn on DTU
YFLAG	Channel Y flag
ZERO	Zero

APPENDIX A

DATA DESCRIPTION

This Appendix is Extracted from Volume 3
of this Series, and Contains Information of
Special Reference to the TOMCAT-II Program

GENERAL DESCRIPTION OF THE DATA TRAIN

The Gemini spacecraft transmits one cycle of data every 2.4 seconds at a rate of 51.2 kilobits per second. After one cycle of data has been transmitted, the arrangement of the parameters, but not necessarily the values, start repeating.

This array of data can be depicted as a matrix of 80 columns by 192 rows, where the columns are called Channels and the rows are called Frames (80 Channels by 192 Frames). Any one position, for instance Frame 3, Channel 4, represents one eight-bit portion of the data train (note X in Figure 1).

The spacecraft data is received and conditioned by the PCM ground stations. The data is then transmitted through the TOB#2 to the TOMCAT Computer, where it is accepted and processed in compliance with the requirements of the particular site that is receiving the data. For more detailed information regarding the PCM and TOB#2, it is suggested that reference be made to their specific manuals.

There are five input modes received by the TOMCAT-II Program from the PCM-TOB#2 that must be considered; Gemini Real-Time, Gemini Tape Playback (Real-Time and Dump), and Agena (Real-Time and Dump). The Agena

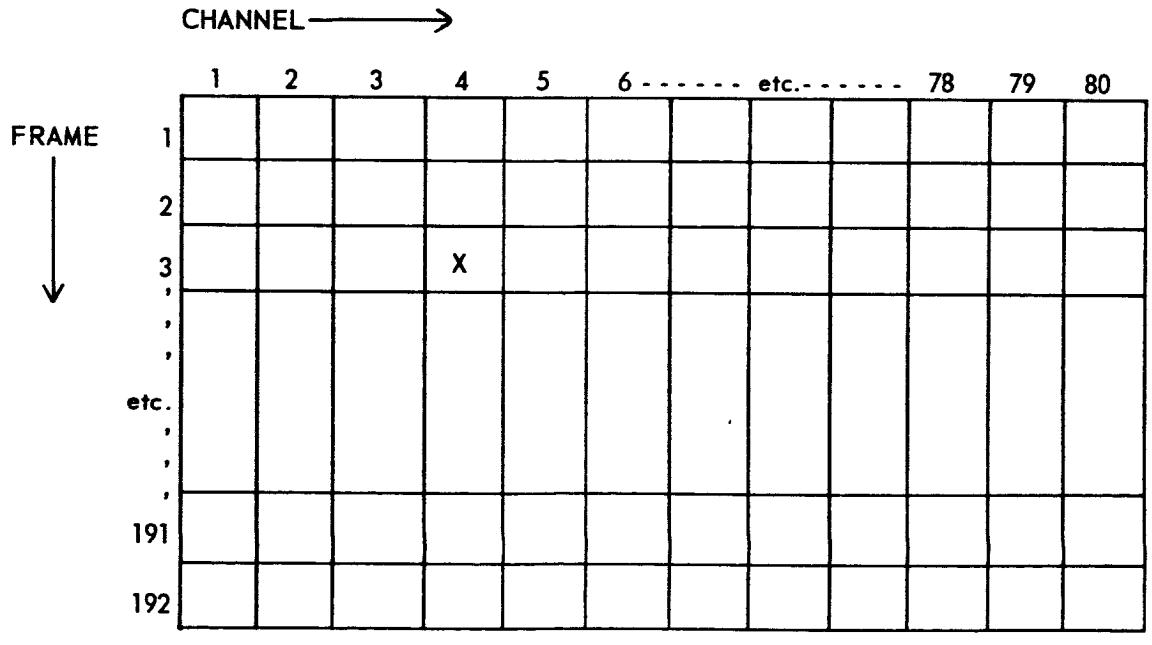


Figure 1. 15,360 Eight-bit Words

Real-Time Data Train contains exactly the same data as the Agena Dump Data, but this type of data will not be discussed at this time as not enough is known about the Data Train.

DETAIL DESCRIPTION OF THE DATA INPUT MODES FROM THE GEMINI SPACECRAFT

Real-Time Data

During "live", Real-Time data transmission, the spacecraft transmits MSB (Most Significant Bit) first and the TOMCAT programs interpret the data as such. The first word of the first frame is transmitted first, the second word of the first frame is transmitted second, . . . (the first word of the second frame is transmitted the eighty-first time), . . . the eightieth word of the 192nd frame is transmitted the 15,360th time (last) in one cycle of data. In other words, each channel (word) of each frame is transmitted sequentially and then each frame is transmitted sequentially.

The TOMCAT-II Program is required to handle only Prime Sub-Frame and MAP (Message Acceptance Pulse) data, Channels 4, 14, 24, 33, 34, 44, 54, 64 and 74; Channel 33 contains the MAP exclusively, and all other designated channels contain Prime Sub-frame data. All channels not mentioned are referred to as Main Frame Data and generally contain Aero-Medical Data, and Sync Patterns. The PCM equipment is wired to take necessary data from the data train and send it on to the computer. The PCM uses most of the data (both Main Frame and Prime Sub-Frame) to drive meters and lights on the Flight Controllers' Consoles.

The data that is received by the computer can be considered as a matrix of 9 Columns by 192 Rows where the columns are called Channels and rows are called Frames. The Channels are numbered as shown in Figure 2. In order to establish a pattern that simplifies the coding for data transfer purposes, the TOMCAT-II Program interprets the data as 96 Frames of 18 words each, as in Chart E.

Tape Playback Data

The PCM station can record all data received. Therefore, it is possible to review all historical data by playing a tape recording of the data through the system.

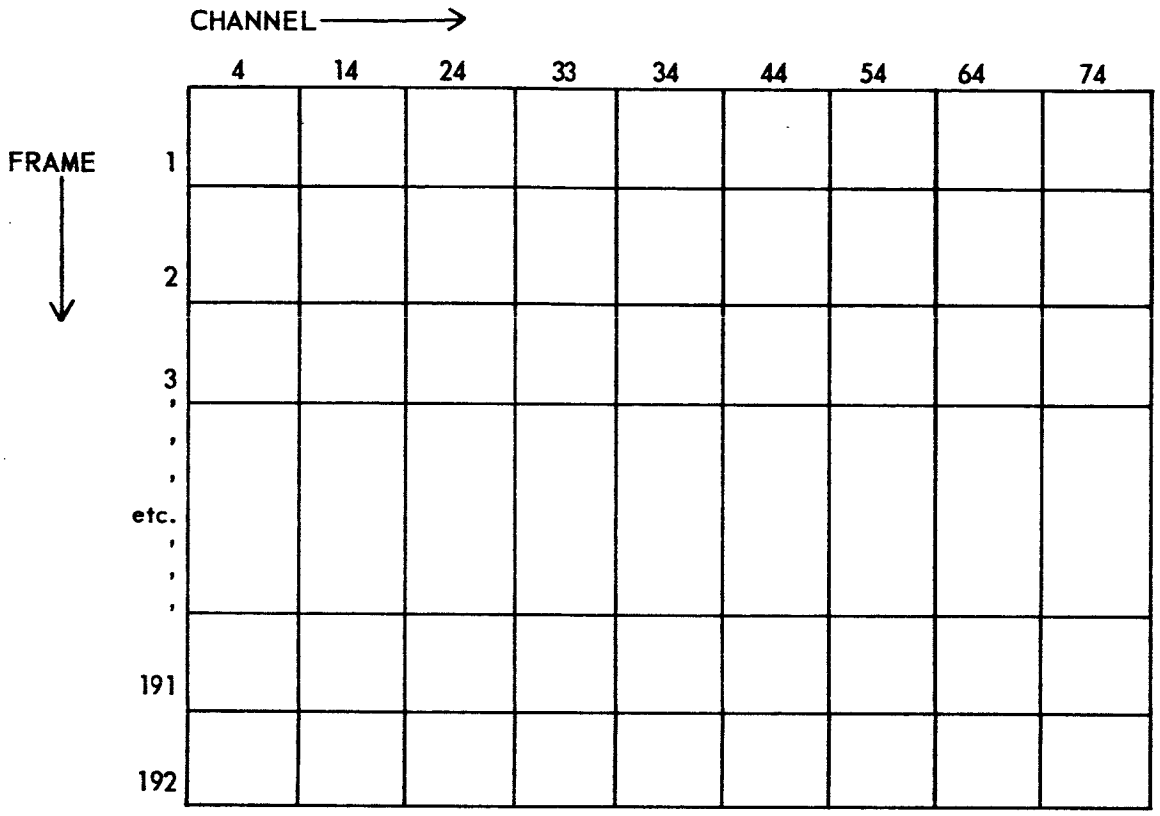


Figure 2. 1,728 Eight-bit Words

Real-Time Tape Playback

Real-Time data is recorded, just as it is received from the Spacecraft, the tape is rewound, and then played through the system. This mode is called Real-Time Tape Playback. It appears as Real-Time Data, except that the Tape Playback Skip Key on the computer must be set to identify it as tape playback.

Dump Tape Playback

A provision has been made to retain as much data as possible while the Spacecraft is out of range of any of the tracking sites. The Spacecraft records on tape what is known as the Prime Sub-Frame data (approximately one-tenth of the entire data train) starting at LOS (Loss Of Signal). Specifically, channels 4, 14, 24, 34, 44, 54, 64, and 74 of each frame of data are recorded. The recording of these data is done the same as if the recorder were receiving transmitted data. In other words, it records Frame 1/Channel 4 first, Frame 1/Channel 14 second, . . . , Frame 1/Channel 74 eighth, Frame 2/Channel 4

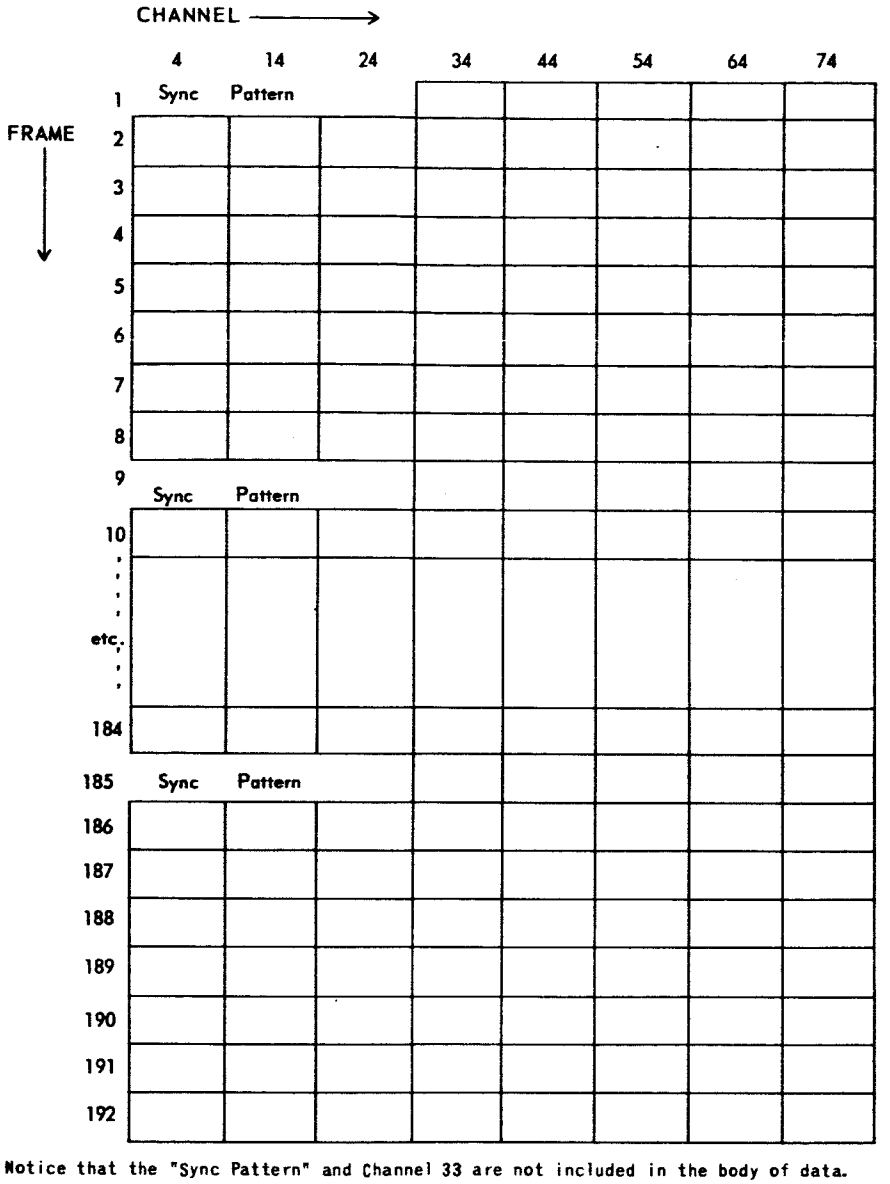
ninth, . . . , and Frame 192/Channel 74 is recorded last for each cycle. When the Spacecraft again comes into range of a tracking site and AOS (Acquisition Of Signal) has been established, the Site will command the capsule to transmit this recorded data (commonly called Dump Data). Without rewinding the tape, the Spacecraft starts transmitting the last data it recorded, and continues to do so until all recorded data has been transmitted. The sequence of the parameters is reversed (i.e., for each cycle Frame 192/Channel 74 is transmitted first and Frame 1/Channel 4 is transmitted last). Also, only the Prime Sub-Frame Data (Note—the MAP data is not included in this) is transmitted. The data is recorded on tape at the site and played back through the system. The tape is not rewound prior to playing through the system thus insuring that the data is in the correct sequence.

Since the PCM used sync patterns that were in the main frame data to stay in synchronization, something else must be used for Dump data. Therefore, a Sync Pattern was included in the Prime Sub-Frame data and occurs every eighth frame starting with Frame 1 and is located in Channels 4, 14, and 24. When in the Dump data mode this pattern never gets into the computer. Therefore, the Dump data format will appear as shown in Figure 3. When Dump data is being "played" through the system, the PCM sets a bit in the data words to identify it as such. When the TOMCAT Programs recognize the Tape Playback Dump Mode, they compensate for the fact that in each Frame, Channel 33 and in every eighth Frame the three Sync words have been omitted, thereby reducing the number of observations in one cycle of data by 264 (192 MAP words and 72 Sync words). In order to establish a pattern that simplifies the necessary coding for data transfer purposes, the TOMCAT-II Program, when processing Gemini Dump Data, interprets the data as 24 Frames of 61 words each, as in Chart F.

Transmission Via High Speed (2 KBS) Lines

Two (2) of the tracking sites; namely Bermuda and Corpus Christi, have the capability to transmit data at high speed (2 K) to the Manned Spacecraft Center, Houston, Texas. These sites will be receiving data from the spacecraft, compressing and editing the size of the data train into another format that will be transmitted to the receiving center. One cycle of high speed data is transmitted every 2 seconds at the 2 KBS rate.

The Flight Controllers designate which parameters and at what rate they will be transmitted, and in some instances what order they will be transmitted. Their requirements as to which parameters will be transmitted usually include the parameters that are to be available to the low speed programs for both the RO and TTY. This must also be coordinated with the PCM personnel in order to assure continuity.



Notice that the "Sync Pattern" and Channel 33 are not included in the body of data.

Figure 3. 1,464 Eight-bit Words

2 KBS

This cycle of data may be visualized as 500 sequential eight-bit words starting with the necessary Sync pattern and Station Identification Number. Chart 2 describes the two second cycle, showing the sequence of the parameters as they are transmitted. Note that this is not necessarily the sequence or contents of any required cycle after GT-3, and that the blanks will have a "fill pattern" transmitted in that location.

CHART 2

ONE CYCLE OF HIGHSPEED DATA (2KBS) TRANSMISSION TIME – 2 SECONDS MASTER LIST PRINCIPLE USED

GEMINI HIGH SPEED OUTPUT BUFFER FOR GT-3 ONLY

SYNC 1	SYNC 2	SYNC 3	ID MSG.LB 4	STATUS WORD 5	LA01 6	SITE ID 7	AA01 8	F 9	KA01 10	F 11	LA01 12	F 13	EA01 14	X1 15	F 16	F 17	LA01 18	F 19	F 20	F 21	F 22	F 23	LA01 24	F 25
G 26	G 27	BD01 28	BD02 29	BE01 30	LA01 31	X2 32	AA01 33	BE02 34	KA02 35	BF01 36	LA01 37	BF05 38	EA02 39	BH01 40	BH02 41	G 42	LA01 43	F 44	CD03 45	F 46	X3 47	JE09 48	LA01 49	G 50
G 51	BA04 52	CH01 53	CH02 54	CJ15 55	LA01 56	CK05 57	AA01 58	GB01 59	KA03 60	GB02 61	LA01 62	X4 63	EA03 64	JC02 65	BA01 66	G 67	LA01 68	AA03 69	AA03 70	AA03 71	BA03 72	JC01 73	LA01 74	G 75
JE05 76	G 77	F 78	X5 79	F 80	LA01 81	BA02 82	AA01 83	G 84	KB02 85	G 86	LA01 87	JE01 88	G 89	G 90	JC03 91	G 92	LA01 93	F 94	X6 95	F 96	G 97	JB03 98	LA01 99	G 100
AG06 101	HH06 102	AA02 103	AA02 104	AA02 105	LA01 106	G 107	AA01 108	F 109	F 110	X7 111	LA01 112	F 113	FA01 114	BG01 115	BG02 116	BG03 117	LA01 118	F 119	F 120	F 121	BG04 122	CA01 123	LA01 124	CA02 125
CA03 126	X8 127	F 128	F 129	F 130	LA01 131	CA04 132	AA01 133	CB01 134	F 135	CB02 136	LA01 137	CB03 138	FA02 139	CB07 140	CC01 141	X9 142	LA01 143	DH01 144	DH01 145	DH01 146	CC02 147	CC03 148	LA01 149	CC04 150
CC06 151	CH04 152	DH02 153	DH02 154	DH02 155	LA01 156	CH05 157	AA01 158	X10 159	F 160	CJ01 161	LA01 162	CJ02 163	FA03 164	CJ03 165	CJ04 166	CK01 167	LA01 168	DH03 169	DH03 170	DH03 171	CK02 172	CK03 173	LA01 174	X11 175
CK04 176	CL02 177	DH07 178	DH07 179	DH07 180	LA01 181	CL03 182	AA01 183	CL05 184	F 185	DA01 186	LA01 187	DA02 188	DA03 189	DB03 190	X12 191	DB06 192	LA01 193	DH08 194	DH08 195	DH08 196	DD01 197	DD02 198	LA01 199	DD03 200
DE01 201	DE02 202	DH09 203	DH09 204	DH09 205	LA01 206	X13 207	AA01 208	DE05 209	DG01 210	DG02 211	LA01 212	DG03 213	EB01 214	EB02 215	EC01 216	EC02 217	LA01 218	DH13 219	DH13 220	DH13 221	EC03 222	X14 223	LA01 224	EC04 225
EC05 226	F 227	DH14 228	DH14 229	DH14 230	LA01 231	F 232	AA01 233	F 234	F 235	F 236	LA01 237	F 238	X15 239	F 240	F 241	G 242	LA01 243	DH04 244	DH04 245	DH04 246	G 247	F 248	LA01 249	F 250
F 251	F 252	F 253	F 254	F 255	LA01 256	F 257	AA01 258	F 259	KA01 260	F 261	LA01 262	F 263	EA01 264	X1 265	F 266	F 267	LA01 268	F 269	F 270	F 271	F 272	F 273	LA01 274	F 275
GC02 276	GC03 277	GC04 278	HA02 279	HB02 280	LA01 281	X2 282	AA01 283	HC05 284	KA02 285	HC06 286	LA01 287	F 288	EA02 289	F 290	F 291	LA05 292	LA01 293	LB04 294	LD01 295	G 296	X3 297	MA38 298	LA01 299	MB02 300
MC02 301	PB05 302	PC03 303	PD04 304	PD06 305	LA01 306	PD08 307	AA01 308	PE11 309	KA03 310	PE12 311	LA01 312	X4 313	EA03 314	CM01 315	G205 316	CD04 317	LA01 318	AA03 319	AA03 320	AA03 321	CL06 322	F 323	LA01 324	F 325
G 326	G 327	F 328	X5 329	F 330	LA01 331	G 332	AA01 333	G 334	KB02 335	G 336	LA01 337	G 338	CK06 339	G 340	G 341	G 342	LA01 343	F 344	X6 345	F 346	G 347	G 348	LA01 349	G 350
GC01 351	GC05 352	DH05 353	DH05 354	DH05 355	LA01 356	GD09 357	AA01 358	HC01 359	GB04 360	X7 361	LA01 362	HC02 363	FA01 364	HC03 365	HC04 366	HD03 367	LA01 368	DH06 369	DH06 370	DH06 371	HH01 372	GB06 373	LA01 374	HH07 375
G 376	X8 377	DH11 378	DH11 379	DH11 380	LA01 381	CL08 382	AA01 383	G 384	G 385	G 386	LA01 387	GB03 388	FA02 389	G 390	G 391	X9 392	LA01 393	DH10 394	DH10 395	DH10 396	G 397	LA02 398	LA01 399	LA03 400
LA04 401	LA06 402	DH12 403	DH12 404	DH12 405	LA01 406	LA07 407	AA01 408	X10 409	CL07 410	LA08 411	LA01 412	LA09 413	FA03 414	LB01 415	LB03 416	G 417	LA01 418	DH15 419	DH15 420	DH15 421	G 422	MA17 423	LA01 424	X11 425
MA21 426	MA24 427	DH16 428	DH16 429	DH16 430	LA01 431	MA37 432	AA01 433	MA95 434	G 435	MB03 436	LA01 437	MC01 438	NA06 439	NB06 440	X12 441	QB04 442	LA01 443	DH17 444	DH17 445	DH17 446	G 447	G 448	LA01 449	G 450
G 451	G 452	DH18 453	DH18 454	DH18 455	LA01 456	X13 457	AA01 458	G 459	G 460	JB02 461	LA01 462	G 463	JB04 464	G 465	G 466	G 467	LA01 468	DH19 469	DH19 470	DH19 471	JD01 472	X14 473	LA01 474	G 475
F 476	F 477	DH20 478	DH20 479	DH20 480	LA01 481	F 482	AA01 483	F 484	F 485	F 486	LA01 487	F 488	X15 489	F 490	F 491	G 492	LA01 493	DH21 494	DH21 495	DH21 496	G 497	F 498	LA01 499	F 500

LEGEND SHOWING RELATIONSHIP OF PARAMETERS

Δ - 1 OF 112 ANALOG PARAMETERS
○ - 1 OF 48 ANALOG PARAMETERS
⊖ - 1 OF 3 ANALOG PARAMETERS
● - 1 OF 3 ANALOG PARAMETERS

✱ - 1 OF 8 ANALOG PARAMETERS
✱ - MAP (LA01) WHEN TRANSMITTING "DUMP" DATA - FILLED WITH FILL PATTERN
●● - TIME SINCE LIFT-OFF
X - BI-LEVEL PARAMETERS (1 THROUGH 15)

▬ - 24-BIT DIGITAL PARAMETER STATUS WORD - USED BY BUFFER FORMATTER
ID - RTCC MESSAGE LABEL
G - GARBAGE
F - FILL PATTERN

LOCATING PARAMETERS

General

Once the Flight Controllers have submitted their lists of parameters to be included in the 2KBS output buffer (Chart 2), it becomes the function of the TOMCAT Systems Group to verify that all of the parameters in the groups are among the Prime Sub-Frame Data. This is accomplished by using two of McDonnell Aircraft Corporation's publications, namely: 1) Gemini Instrumentation Book "A", and 2) Gemini Instrumentation Book "B". These will be referred to as Book "A", and Book "B" respectively.

Book "A" is a document that contains information regarding all parameters that will be available to the computer during the entire Gemini-Titan Project. It should be referenced when information regarding 1) parameter range, 2) scaling factors (instrument range), and 3) parameter applicability to certain missions, is desired. The TOMCAT Systems Group is responsible for incorporating all types of changes in the system.

Book "B" is a document that is primarily published to give information regarding specific parameters used during specific missions. This book will be updated approximately once a month between missions, except during a period of about six weeks prior to a mission when it will be published on a weekly basis. It is necessary that the person describing the 2KB output buffer be continuously aware of changes to this book since it contains all information regarding the location and sampling rate of the parameters that are available to the computer.

Confirmation of Parameters

If it is desired, obtain a copy of the latest editions of Book "A" and Book "B" and study the introduction entitled Column Definitions in Book "A". Much of this information is not useful at present, but if the scope of the TOMCAT program is redefined, then this information will become very important.

The columns that afford the presently desired information are listed with their significance noted after them, namely:

1) 1. Seq. No. (Sequence Number)—

2) 2. Parameter Name—The names of these two column headings are self-explanatory, although their significance is that they afford a direct method of associating and comparing information.

3) 13. Revision—An "R" in this column denotes some changes to the corresponding parameter. These changes should be studied further to determine whether or not the revision has effected the TOMCAT system. If so, adjustments to the system must be made.

4) 16. Spacecraft Effectivity—Under this column header is a column for each of the 12 planned Gemini-Titan Missions. Any symbol other than an "X" under the particular mission in which there is interest when associated to a desired parameter is enough justification to bring the facts which are indicated by the "other" symbol to the Flight Controllers' attention. They will then make the necessary changes.

After examination of Book "A", it has been determined which parameters are located in the data train. Next, information regarding availability of that data to the computer must be obtained. This is done by comparing required parameters with those parameters listed in Book "B". There are three columns in Book "B", one (Format Location) will locate the parameters, and the other two (Sequence Number and Parameter Name) are for correlation. Format Location is the column that contains the desired information, namely:

1) Type of parameter—

a. High level analog (0 to 5 volts) - symbol "H"
b. Low level analog (0 to 20 millivolts) - symbol "L"
c. Digital parameter (twenty-four-bits) - symbol "D", also Time parameter - symbol "T"
d. Bilevel parameter (one-bit of an eight-bit group) - symbol "B" or "P" - bit location in the eight-bit group is also indicated.

2) Parameter Sampling rate—

a. 080 - The sampling rate of eighty samples per second or any rate higher than this indicates that the parameter is not available to the computer as the parameter is included in the Main Frame Data. The one exception to this rule is the parameter named Message Acceptance Pulse (MAP), Sequence Number LA01. This is sampled at eighty times per second (192 times per cycle) and is available to the computer during "live" transmission. NOTE: Each cycle of data consumes 2.4 seconds.
b. 040 - Parameters with this sampling rate are available to the computer and appear 96 times per cycle.
c. 010 - Parameters with this sampling rate are available to the computer and appear 24 times per cycle.

d. 1.2 - Parameters with this sampling rate are available to the computer and appear 3 times per cycle.

e. .42 - Parameters with this sampling rate are available to the computer and appear once per cycle.

Formula for determining number of times a parameter will appear during one cycle of data is "Sampling Rate X 2.4 Sec. approximately equals Times Appearing per Cycle."

3) Plug and Pin Number—This information concerns the spacecraft. The Pin Number is used when trying to locate the On-Board Computer parameters.

4) Spacecraft Number—The last three or four characters of the Format Location Number are unique to each of the listed parameters (including Bilevel parameters). The Spacecraft Number always starts with a letter and is followed by two or three digits. The uniqueness of this number holds for all cases except in the case of the 21 On-Board Computer parameters. In this case, the last two digits of the Plug and Pin Number must be used to tie down the parameter location. See Page 8 of Chart C. (Examples shown below)

Examples:
1) 4B010P35 A062
2) D.42P61-00A107
3) H1.2P06-05F 46
4) L1.2P18-04D 05
5) H040P04 A022

- A022 — Spacecraft Number
- P04 — Plug and Pin Number
- 040 — Sampling Rate
- H — Type of Parameter
- 4 — Bit Position of Bilevel Parameter in a Bilevel Group*

*- There are eight bits in each Bilevel group. Each bit is numbered one through eight (1,2,3,4,5,6,7,8), with bit number one being the MSB and bit number eight being the LSB. Therefore, this parameter is the fourth MSB (11001100).

Any number that falls under this column that is not similar to those included in the above examples may be interpreted as saying that this parameter is not located in the Prime Sub-Frame data.

Once both Books "A" and "B" have been referenced and it has been determined that the required parameters are available, the 2KBS output buffer may be described. The Master List information will greatly speed the preparation of this output buffer.

Location of Parameters and Preparation of the Visual Aid Charts

Each Frame/Channel is associated with a particular Spacecraft Number and the relationship between the two remains constant on all Gemini-Titan Missions. The relationship is shown by Chart A. As this relationship holds for each mission, a chart showing the Spacecraft Number associated with each Frame/Channel location was made. The chart is labeled Chart B. A study of Chart A in order to determine how Chart B was derived is in order as Chart B will be used throughout the entire Gemini-Titan Project. This should be very easily understood as there is a direct relationship in each of the charts. A close look will quickly bring this out. It is suggested that the person that is most involved with the data train and parameter location become very familiar with the repeating sequence of certain parameters and groups or type of parameters. Once this pattern of repetition has been recognized it will speed up the process of locating parameters. This pattern also aids the coding of the lists necessary for transferring the data from the input to the output buffers.

Now it becomes very easy to associate the parameters with the correct Frame/Channel. The preparation of a visual aid chart describing the location of each parameter received by the computer is now possible. This visual aid chart should be prepared for each mission. But, the preparation of the chart is not necessary until approximately six or eight weeks prior to the particular mission affected.

Prepare six sheets of a form similar to that used in Chart B, leaving all blocks blank except for the top two rows. Then number the Frames from 1 to 192 as in Chart B. Fill in the Frame/Channel blocks that are designated LA01 (MAP, Channel 33), X 1 through X 15, and draw the heavy lines that indicate a Twenty-four-Bit parameter, as in Chart B. This is done first as these three types of parameters always occur in the locations shown and will greatly facilitate the positioning of the other parameters. Then prepare forms similar to those on the last two pages of Chart B. This brings attention to the Bilevel and Twenty-four-Bit parameters.

While referencing both Books "A" and "B" check each parameter for effectivity (a dash "-" in Book "A" indicates not effective). Once parameter effectivity has been established, take the associated Spacecraft Number from Book "B" and locate all places that this number occurs in Chart B. As a/all position(s) are located fill in the Sequence Number in that/all block(s) on the new

form. (For example: Sequence Number AA01 is effective for all missions from GT-2 through GT-12. It's Spacecraft Number is A034, which is located in Frame 2, 10, 18,---, 186/Channel 24. In those blocks on the new form enter AA01.) In this manner, all parameters that are effective and have a Format Location Number will be located in each cycle of data. The finished visual aid chart will appear similar to Chart C (GT-3 One Cycle of "Live" Real-Time Data), which is exactly how the data cycle looked for GT-3. There are some blanks in this chart as those locations were not used. A "fill pattern" is transmitted in these locations. This, then, describes one cycle of Prime Sub-Frame Data (including MAP).

Prepare six sheets of the form used to prepare Chart C. It is not necessary to prepare the form used to describe the Bilevel and Twenty-four-Bit parameters as Chart C may be used for this purpose. Using the Master List concept for determing which parameters might be sampled for the high-speed (2 K) program during any one cycle of data, then find in Chart C the locations of all parameters being sampled at a certain rate. Enter the Sequence Number of the parameter being sampled in the proper location on the new visual aid chart. Once this operation has been completed for all requested parameters, the final product will appear as Chart E (GT-3 Parameters Sampled During Any One Cycle for High-Speed (2 KBS) Transmission).

2 KBS

The Flight Controllers state the requirements as to the rate that each parameter is transmitted per 2 second cycle. For example: The MAP (LA01) will be transmitted 80 times per cycle, the 15 Bilevel groups of parameters will be transmitted twice per cycle, and each Twenty-four-Bit parameter will be transmitted once per cycle. Chart 2 shows the arrangement of the parameters as each cycle of 2 K data is transmitted. The parameters are arranged in this order by the coding in the TOMCAT-II Program. A "Master List" as described in Chart F keeps the TOMCAT-II program constant but changes Chart 2 from mission to mission. When it is desired to change the arrangement of the parameters, as a result of changes in requirements, the TOMCAT-II Program coding must be changed. When changes are made a TOMCAT-II Program Tape must be generated for each site transmitting 2 KBS data. This new tape must be forwarded to the appropriate sites for incorporation in the system prior to the missions affected.

When requirements for the TOMCAT-II parameters are received it is suggested that they be compared with the existing (old) requirements. In doing this, unnecessary changes may be avoided and the format of Chart 2 showing the arrangement of parameters may require very little change. Correspondingly,

this would require no changes in the coding of the TOMCAT-II Program. This effort should be coordinated with the programmer most directly associated with this program. For each mission there should be a new listing of requirements describing the parameters to be transmitted. After this list is received and checked with the program a new Gemini High-Speed (2 KBS) Output Buffer Table (similar to Chart 2) must be prepared and distributed to the appropriate personnel (especially to those people at Cape Kennedy).

Once the requirements have been thoroughly analyzed, regarding the parameters to be transmitted and the number of times each is to be transmitted per cycle, the TOMCAT-II programmer must decide how often and when to sample those requested parameters from the data train. These decisions are based somewhat on the basic logic developed in the TOMCAT-II Program. Following is a brief discussion of this logic.

The TOMCAT-II Program receives only Gemini Real-Time, Gemini Tape Playback (Real-Time and Dump), and Agena (Real-Time and Dump) data. The Gemini Real-Time and Tape Playback-Real-Time are handled in the same manner, as the data trains are identical. When handling these two formats, the TOMCAT-II program inputs two frames of data (18 eight-bit groups). As this is the case, the program sees the data train as 96 Frames of 18 Channels as opposed to the normal 192 Frame of 9 Channels. Now, depending on the number of the Frame (1 thru 96) and the parameters that are to be sampled in that frame, the program extracts those parameters and stores them into the High-Speed (2 K) Output Buffer (Chart 2). Once the initial Output Buffer has been filled with all of the required parameters, it is then initiated for Output. The Output Buffer is then in a continuous state of Outputting (transmitting); and cannot be stopped until the computer is stopped. Remember that this is a two second cycle of transmission and that the data train cycle of transmission is 2.4 seconds. Then, recall that the spacecraft data received is different in sequence and content than that transmitted. Therefore, it is noted that these two data trains are never in synchronization. This being the case, the parameters must be sampled from the original data in such a manner as to assure that the most up-to-date data is included in the 2 KBS data stream. Sampling this original data three times per 2.4 second cycle for each time a parameter is required to be transmitted at the 2 KBS rate will insure that they are up-to-date. This, naturally, cannot be done if a parameter is sampled only once per cycle of data or if it is required that the parameter be transmitted at a 1:1 ratio (1 received, 1 transmitted) or at a 192:96 ratio as is the case of AA01 and LA01 respectively.

Since some parameters change location in the data train or are deleted entirely from the data train from mission to mission, it is a good idea to pinpoint the location of the required parameters for each mission by preparing these

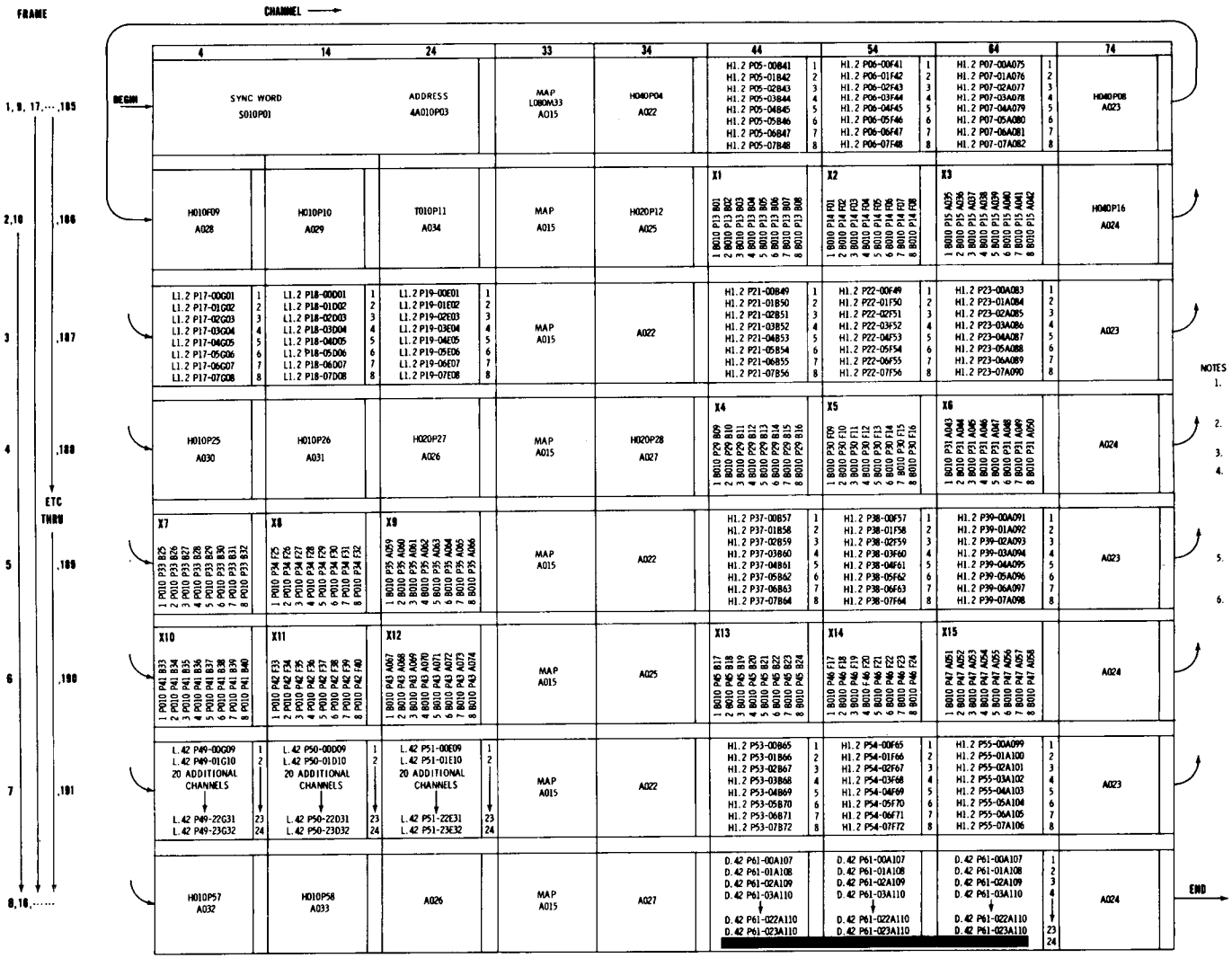
visual aid charts. Some of these charts have been described previously; however, one more is necessary. This chart should describe the location of those "Parameters Sampled During One Cycle for High-Speed (2 KBS) Transmission" for each mission, as Chart E does for GT-3. When preparing this chart for other missions the format used in Chart E should be followed, keeping in mind the stated Sampling ratios. When the TOMCAT-II Program is handling the Tape Playback Dump Mode, it should be noted that the program logic is different. The differences result from the facts that 1) Sync Pattern and 2) MAP are not included in the data train. As this is the case, the program brings in 61 eight-bit groups per input buffer and then places the appropriate observations in the correct locations in the OutputBuffer. These changes in logic are reflected in the program.

Now that the Tape Playback Dump Mode has been sufficiently covered, notice that new visual aid charts are not necessary for this mode. This is obviously the case as all of the information is contained in the other charts that have been described. But, it must be remembered that the Sync Pattern, and MAP words are not included in this mode, and these facts must be taken into consideration when working with this mode.

Once it is understood how Chart 2 is derived from Chart F and Chart E, it can be seen that another chart which would be of more permanent value could be generated. It will be noted that Chart B was made and described as a chart that would hold for all subsequent Gemini missions. It therefore stands that with a Master Lists concept incorporated in the TOMCAT-II Program, that the Gemini High-Speed (2 KBS) Output Buffer can be described in terms that will hold for all Gemini missions. Therefore, if Chart F and Chart B are referenced and the information from Chart B is placed on another chart (Chart G), which is laid out in the form of a Gemini High Speed (2 KBS) Output Buffer, with regard to the locations specified by Chart F, then it can be seen that the Gemini High-Speed (2 KBS) Output Buffer is described in terms that will remain constant for all Gemini missions (i.e., the terms are Spacecraft Numbers). Therefore, it may be stated that the newly discussed Chart G will remain effective for all missions as a description of the TOMCAT-II Gemini Output.

An aid to program checkout has been generated and is enclosed in Attachment 1 of this Appendix. This attachment will further describe Chart G in that it lists the Spacecraft Numbers as they are transmitted by the TOMCAT-II Program. This document also includes the Octal Value that should be transmitted by the program during a test run with the data source being the PCM Confidence Tape #299 (also referred to as the "ABC" tape). If during a test run the program were stopped and a dump of the computer memory locations that comprise the Gemini Output Buffer were obtained, then the Octal Values listed in this Attachment should agree with the Octal Values printed on the I/O Console.

Chart A



NOTES

1. FR 1, 9 ETC/CH 4, 14, 24 CONTAINS 19 BITS OF RECYCLE SYNC AND 5 BITS OF ID SYNC.
2. FR 8, 16 ETC/CH 44, 54, 64 CONTAIN THE 24 BIT CMPTR WORDS.
3. ALL OTHER CH CONTAIN 8 BIT WORDS.
4. SPACECRAFT NUMBER (LAST 3 OR 4 CHARACTERS)
   - A - PROGRAMMER
   - B - HI-LEVEL MULTI • 1 RE ENTRY
   - D - LO-LEVEL MULTI • 1 RE ENTRY
   - F - HI-LEVEL MULTI ADAPTER
   - G - LO-LEVEL MULTI ADAPTER
5. FRS 1 THRU 8/CH 33 CONTAINS MESSAGE ACCEPTANCE PULSE - SPECIAL CASE.
6. BILEVELS (X1 THRU X15) CONTAIN 8 PARAMETERS WHICH ARE SAMPLED EACH TIME A BILEVEL GROUP IS SAMPLED.

GEMINI Real Time and Tape Playback (Real Time) Matrix

Spacecraft Numbers for All Cycles of Data

CHART B

Channel Number →

Frame	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
	←			Odd	Frame	→				←				Even	Frame	→		
1 & 2	SYNC	SYNC	SYNC	A015	A022	B 41	F 41	A075	A023	A028	A029	A034	A015	A025	X 1	X 2	X 3	A024
3 & 4	G 01	D 01	E 01			B 49	F 49	A083		A030	A031	A026		A027	X 4	X 5	X 6	
5 & 6	X 7	X 8	X 9			B 57	F 57	A091		X 10	X 11	X 12		A025	X 13	X 14	X 15	
7 & 8	G 09	D 09	E 09			B 65	F 65	A099		A032	A033	A026		A027	A107	A107	A107	
9 & 10	SYNC	SYNC	SYNC			B 42	F 42	A076		A028	A029	A034		A025	X 1	X 2	X 3	
11 & 12	G 02	D 02	E 02			B 50	F 50	A084		A030	A031	A026		A027	X 4	X 5	X 6	
13 & 14	X 7	X 8	X 9			B 58	F 58	A092		X 10	X 11	X 12		A025	X 13	X 14	X 15	
15 & 16	G 10	D 10	E 10			B 66	F 66	A100		A032	A033	A026		A027	A108	A108	A108	
17 & 18	SYNC	SYNC	SYNC			B 43	F 43	A077		A028	A029	A034		A025	X 1	X 2	X 3	
19 & 20	G 03	D 03	E 03			B 51	F 51	A085		A030	A031	A026		A027	X 4	X 5	X 6	
21 & 22	X 7	X 8	X 9			B 59	F 59	A093		X 10	X 11	X 12		A025	X 13	X 14	X 15	
23 & 24	G 11	D 11	E 11			B 67	F 67	A101		A032	A033	A026		A027	A109	A109	A109	
25 & 26	SYNC	SYNC	SYNC			B 44	F 44	A078		A028	A029	A034		A025	X 1	X 2	X 3	
27 & 28	G 04	D 04	E 04			B 52	F 52	A086		A030	A031	A026		A027	X 4	X 5	X 6	
29 & 30	X 7	X 8	X 9			B 60	F 60	A094		X 10	X 11	X 12		A025	X 13	X 14	X 15	
31 & 32	G 12	D 12	E 12			B 68	F 68	A102		A032	A033	A026		A027	A110	A110	A110	

Spacecraft Numbers for All Cycles of Data

CHART B

Channel Number →

Frame ↓

Frame	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
	←			Odd	Frame				→	←				Even	Frame			→
33 & 34	SYNC	SYNC	SYNC	A015	A022	B 45	F 45	A079	A023	A028	A029	A034	A015	A025	X 1	X 2	X 3	A024
35 & 36	G 05	D 05	E 05	↓	↓	B 53	F 53	A087	↓	A030	A031	A026	↓	A027	X 4	X 5	X 6	↓
37 & 38	X 7	X 8	X 9	↓	↓	B 61	F 61	A095	↓	X 10	X 11	X 12	↓	A025	X 13	X 14	X 15	↓
39 & 40	G 13	D 13	E 13	↓	↓	B 69	F 69	A103	↓	A032	A033	A026	↓	A027	A110	A110	A110	↓
41 & 42	SYNC	SYNC	SYNC	↓	↓	B 46	F 46	A080	↓	A028	A029	A034	↓	A025	X 1	X 2	X 3	↓
43 & 44	G 06	D 06	E 06	↓	↓	B 54	F 54	A088	↓	A030	A031	A026	↓	A027	X 4	X 5	X 6	↓
45 & 46	X 7	X 8	X 9	↓	↓	B 62	F 62	A096	↓	X 10	X 11	X 12	↓	A025	X 13	X 14	X 15	↓
47 & 48	G 14	D 14	E 14	↓	↓	B 70	F 70	A104	↓	A032	A033	A026	↓	A027	A110	A110	A110	↓
49 & 50	SYNC	SYNC	SYNC	↓	↓	B 47	F 47	A081	↓	A028	A029	A034	↓	A025	X 1	X 2	X 3	↓
51 & 52	G 07	D 07	E 07	↓	↓	B 55	F 55	A089	↓	A030	A031	A026	↓	A027	X 4	X 5	X 6	↓
53 & 54	X 7	X 8	X 9	↓	↓	B 63	F 63	A097	↓	X 10	X 11	X 12	↓	A025	X 13	X 14	X 15	↓
55 & 56	G 15	D 15	E 15	↓	↓	B 71	F 71	A105	↓	A032	A033	A026	↓	A027	A110	A110	A110	↓
57 & 58	SYNC	SYNC	SYNC	↓	↓	B 48	F 48	A082	↓	A028	A029	A034	↓	A025	X 1	X 2	X 3	↓
59 & 60	G 08	D 08	E 08	↓	↓	B 56	F 56	A090	↓	A030	A031	A026	↓	A027	X 4	X 5	X 6	↓
61 & 62	X 7	X 8	X 9	↓	↓	B 64	F 64	A098	↓	X 10	X 11	X 12	↓	A025	X 13	X 14	X 15	↓
63 & 64	G 16	D 16	E 16	↓	↓	B 72	F 72	A106	↓	A032	A033	A026	↓	A027	A110	A110	A110	↓

Spacecraft Numbers for All Cycles of Data

CHART B

Channel Number →

Frame ↓

Frame	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
	←			Odd	Frame				→	←				Even	Frame			→
65 & 66	SYNC	SYNC	SYNC	A015	A022	B 41	F 41	A075	A023	A028	A029	A034	A015	A025	X 1	X 2	X 3	A024
67 & 68	G 01	D 01	E 01			B 49	F 49	A083		A030	A031	A026		A027	X 4	X 5	X 6	
69 & 70	X 7	X 8	X 9			B 57	F 57	A091		X 10	X 11	X 12		A025	X 13	X 14	X 15	
71 & 72	G 17	D 17	E 17			B 65	F 65	A099		A032	A033	A026		A027	A110	A110	A110	
73 & 74	SYNC	SYNC	SYNC			B 42	F 42	A076		A028	A029	A034		A025	X 1	X 2	X 3	
75 & 76	G 02	D 02	E 02			B 50	F 50	A084		A030	A031	A026		A027	X 4	X 5	X 6	
77 & 78	X 7	X 8	X 9			B 58	F 58	A092		X 10	X 11	X 12		A025	X 13	X 14	X 15	
79 & 80	G 18	D 18	E 18			B 66	F 66	A100		A032	A033	A026		A027	A110	A110	A110	
81 & 82	SYNC	SYNC	SYNC			B 43	F 43	A077		A028	A029	A034		A025	X 1	X 2	X 3	
83 & 84	G 03	D 03	E 03			B 51	F 51	A085		A030	A031	A026		A027	X 4	X 5	X 6	
85 & 86	X 7	X 8	X 9			B 59	F 59	A093		X 10	X 11	X 12		A025	X 13	X 14	X 15	
87 & 88	G 19	D 19	E 19			B 67	F 67	A101		A032	A033	A026		A027	A110	A110	A110	
89 & 90	SYNC	SYNC	SYNC			B 44	F 44	A078		A028	A029	A034		A025	X 1	X 2	X 3	
91 & 92	G 04	D 04	E 04			B 52	F 52	A086		A030	A031	A026		A027	X 4	X 5	X 6	
93 & 94	X 7	X 8	X 9			B 60	F 60	A094		X 10	X 11	X 12		A025	X 13	X 14	X 15	
95 & 96	G 20	D 20	E 20			B 68	F 68	A102		A032	A033	A026		A027	A110	A110	A110	

Spacecraft Numbers for All Cycles of Data

CHART B

Channel Number →

Frame ↓	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
	←			Odd	Frame	→				←				Even	Frame	→		
97 & 98	SYNC	SYNC	SYNC	A015	A022	B 45	F 45	A079	A023	A028	A029	A034	A015	A025	X 1	X 2	X 3	A024
99 & 100	G 05	D 05	E 05			B 53	F 53	A087		A030	A031	A026		A027	X 4	X 5	X 6	
101 & 102	X 7	X 8	X 9			B 61	F 61	A095		X 10	X 11	X 12		A025	X 13	X 14	X 15	
103 & 104	G 21	D 21	E 21			B 69	F 69	A103		A032	A033	A026		A027	A110	A110	A110	
105 & 106	SYNC	SYNC	SYNC			B 46	F 46	A080		A028	A029	A034		A025	X 1	X 2	X 3	
107 & 108	G 06	D 06	E 06			B 54	F 54	A088		A030	A031	A026		A027	X 4	X 5	X 6	
109 & 110	X 7	X 8	X 9			B 62	F 62	A096		X 10	X 11	X 12		A025	X 13	X 14	X 15	
111 & 112	G 22	D 22	E 22			B 70	F 70	A104		A032	A033	A026		A027	A110	A110	A110	
113 & 114	SYNC	SYNC	SYNC			B 47	F 47	A081		A028	A029	A034		A025	X 1	X 2	X 3	
115 & 116	G 07	D 07	E 07			B 55	F 55	A089		A030	A031	A026		A027	X 4	X 5	X 6	
117 & 118	X 7	X 8	X 9			B 63	F 63	A097		X 10	X 11	X 12		A025	X 13	X 14	X 15	
119 & 120	G 23	D 23	E 23			B 71	F 71	A105		A032	A033	A026		A027	A110	A110	A110	
121 & 122	SYNC	SYNC	SYNC			B 48	F 48	A082		A028	A029	A034		A025	X 1	X 2	X 3	
123 & 124	G 08	D 08	E 08			B 56	F 56	A090		A030	A031	A026		A027	X 4	X 5	X 6	
125 & 126	X 7	X 8	X 9			B 64	F 64	A098		X 10	X 11	X 12		A025	X 13	X 14	X 15	
127 & 128	G 24	D 24	E 24			B 72	F 72	A106		A032	A033	A026		A027	A110	A110	A110	

PAGE 4 of 8

Spacecraft Numbers for All Cycles of Data

CHART B

Channel Number →

Frame	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
	←			Odd	Frame	→				←				Even	Frame	→		
129 & 130	SYNC	SYNC	SYNC	A015	A022	B 41	F 41	A075	A023	A028	A029	A034	A015	A025	X 1	X 2	X 3	A024
131 & 132	G 01	D 01	E 01			B 49	F 49	A083		A030	A031	A026		A027	X 4	X 5	X 6	
133 & 134	X 7	X 8	X 9			B 57	F 57	A091		X 10	X 11	X 12		A025	X 13	X 14	X 15	
135 & 136	G 25	D 25	E 25			B 65	F 65	A099		A032	A033	A026		A027	A110	A110	A110	
137 & 138	SYNC	SYNC	SYNC			B 42	F 42	A076		A028	A029	A034		A025	X 1	X 2	X 3	
139 & 140	G 02	D 02	E 02			B 50	F 50	A084		A030	A031	A026		A027	X 4	X 5	X 6	
141 & 142	X 7	X 8	X 9			B 58	F 58	A092		X 10	X 11	X 12		A025	X 13	X 14	X 15	
143 & 144	G 26	D 26	E 26			B 66	F 66	A100		A032	A033	A026		A027	A110	A110	A110	
145 & 146	SYNC	SYNC	SYNC			B 43	F 43	A077		A028	A029	A034		A025	X 1	X 2	X 3	
147 & 148	G 03	D 03	E 03			B 51	F 51	A085		A030	A031	A026		A027	X 4	X 5	X 6	
149 & 150	X 7	X 8	X 9			B 59	F 59	A093		X 10	X 11	X 12		A025	X 13	X 14	X 15	
151 & 152	G 27	D 27	E 27			B 67	F 57	A101		A032	A033	A026		A027	A110	A110	A110	
153 & 154	SYNC	SYNC	SYNC			B 44	F 44	A078		A028	A029	A034		A025	X 1	X 2	X 3	
155 & 156	G 04	D 04	E 04			B 52	F 52	A086		A030	A031	A026		A027	X 4	X 5	X 6	
157 & 158	X 7	X 8	X 9			B 60	F 60	A094		X 10	X 11	X 12		A025	X 13	X 14	X 15	
159 & 160	G 28	D 28	E 28			B 68	F 68	A102		A032	A033	A026		A027	A110	A110	A110	

Spacecraft Numbers for All Cycles of Data

CHART B

Channel Number →

Frame ↓

Frame	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
				Odd	Frame									Even	Frame			
161 & 162	SYNC	SYNC	SYNC	A015	A022	B 45	F 45	A079	A023	A028	A029	A034	A015	A025	X 1	X 2	X 3	A024
163 & 164	G 05	D 05	E 05			B 53	F 53	A087		A030	A031	A026		A027	X 4	X 5	X 6	
165 & 166	X 7	X 8	X 9			B 61	F 61	A095		X 10	X 11	X 12		A025	X 13	X 14	X 15	
167 & 168	G 29	D 29	E 29			B 69	F 69	A103		A032	A033	A026		A027	A110	A110	A110	
169 & 170	SYNC	SYNC	SYNC			B 46	F 46	A080		A028	A029	A034		A025	X 1	X 2	X 3	
171 & 172	G 06	D 06	E 06			B 54	F 54	A088		A030	A031	A026		A027	X 4	X 5	X 6	
173 & 174	X 7	X 8	X 9			B 62	F 62	A096		X 10	X 11	X 12		A025	X 13	X 14	X 15	
175 & 176	G 30	D 30	E 30			B 70	F 70	A104		A032	A033	A026		A027	A110	A110	A110	
177 & 178	SYNC	SYNC	SYNC			B 47	F 47	A081		A028	A029	A034		A025	X 1	X 2	X 3	
179 & 180	G 07	D 07	E 07			B 55	F 55	A089		A030	A031	A026		A027	X 4	X 5	X 6	
181 & 182	X 7	X 8	X 9			B 63	F 63	A097		X 10	X 11	X 12		A025	X 13	X 14	X 15	
183 & 184	G 31	D 31	E 31			B 71	F 71	A105		A032	A033	A026		A027	A110	A110	A110	
185 & 186	SYNC	SYNC	SYNC			B 48	F 48	A082		A028	A029	A034		A025	X 1	X 2	X 3	
187 & 188	G 08	D 08	E 08			B 56	F 56	A090		A030	A031	A026		A027	X 4	X 5	X 6	
189 & 190	X 7	X 8	X 9			B 64	F 64	A098		X 10	X 11	X 12		A025	X 13	X 14	X 15	
191 & 192	G 32	D 32	E 32			B 72	F 72	A106		A032	A033	A026		A027	A110	A110	A110	

CHART B

Spacecraft Numbers for All Cycles of Data

As the Bilevel Parameters (X 1 through X 15 inclusive) are special cases, in that each of these groups contain eight parameters, the Format Location Number for each possible parameter will be shown with the associated group (X 1, X 2, etc.).

X 1		X 2		X 3		X 4	
1B010P13	B 01	1B010P14	F 01	1B010P15	A035	1B010P29	B 09
2B010P13	B 02	2B010P14	F 02	2B010P15	A036	2B010P29	B 10
3B010P13	B 03	3B010P14	F 03	3B010P15	A037	3B010P29	B 11
4B010P13	B 04	4B010P14	F 04	4B010P15	A038	4B010P29	B 12
5B010P13	B 05	5B010P14	F 05	5B010P15	A039	5B010P29	B 13
6B010P13	B 06	6B010P14	F 06	6B010P15	A040	6B010P29	B 14
7B010P13	B 07	7B010P14	F 07	7B010P15	A041	7B010P29	B 15
8B010P13	B 08	8B010P14	F 08	8B010P15	A042	8B010P29	B 16

X 5		X 6		X 7		X 8	
1B010P30	F 09	1B010P31	A043	1P010P33	B 25	1P010P34	F 25
2B010P30	F 10	2B010P31	A044	2P010P33	B 26	2P010P34	F 26
3B010P30	F 11	3B010P31	A045	3P010P33	B 27	3P010P34	F 27
4B010P30	F 12	4B010P31	A046	4P010P33	B 28	4P010P34	F 28
5B010P30	F 13	5B010P31	A047	5P010P33	B 29	5P010P34	F 29
6B010P30	F 14	6B010P31	A048	6P010P33	B 30	6P010P34	F 30
7B010P30	F 15	7B010P31	A049	7P010P33	B 31	7P010P34	F 31
8B010P30	F 16	8B010P31	A050	8P010P33	B 32	8P010P34	F 32

X 9		X 10		X 11		X 12	
1B010P35	A059	1P010P41	B 33	1P010P42	F 33	1B010P43	A067
2B010P35	A060	2P010P41	B 34	2P010P42	F 34	2B010P43	A068
3B010P35	A061	3P010P41	B 35	3P010P42	F 35	3B010P43	A069
4B010P35	A062	4P010P41	B 36	4P010P42	F 36	4B010P43	A070
5B010P35	A063	5P010P41	B 37	5P010P42	F 37	5B010P43	A071
6B010P35	A064	6P010P41	B 38	6P010P42	F 38	6B010P43	A072
7B010P35	A065	7P010P41	B 39	7P010P42	F 39	7B010P43	A073
8B010P35	A066	8P010P41	B 40	8P010P42	F 40	8B010P43	A074

X 13		X 14		X 15	
1B010P45	B 17	1B010P46	F 17	1B010P47	A051
2B010P45	B 18	2B010P46	F 18	2B010P47	A052
3B010P45	B 19	3B010P46	F 19	3B010P47	A053
4B010P45	B 20	4B010P46	F 20	4B010P47	A054
5B010P45	B 21	5B010P46	F 21	5B010P47	A055
6B010P45	B 22	6B010P46	F 22	6B010P47	A056
7B010P45	B 23	7B010P46	F 23	7B010P47	A057
8B010P45	B 24	8B010P46	F 24	8B010P47	A058

CHART B
Spacecraft Numbers for All Cycles of Data

The twenty-four-bit parameters comprise another special case, in that each parameter must be handled differently as they have unique units and scaling factors. This is the only case, at present, where the TOMCAT programs are required to present on the ROs the values of each parameter in engineering units. Therefore, it must be noted that when the TOMCAT I and/or the TOMCAT III programs are handling Tape Playback or Real-Time data that the three eight-bit groups of each parameter are arranged (sequence in the computer data storage area) in a least, middle, most significant order. When the TOMCAT III program is processing 40.8 KBS high speed data the arrangement of the significances of the eight-bit groups are in the same above mentioned order. But, when the TOMCAT III program is processing 2 KBS high-speed data the order of the arrangement is reversed, namely: most, middle, least significance.

For each mode of the On-Board Computer parameters, it is required that the parameters be listed in sequence regarding their Seq. No. (i.e., D*01, D*02,---, D*20, D*21). Note that this is not always the sequence in which they occur in the data train. For a more detailed discussion of this special case see Attachment 1, paying particular attention to the tables at back of this exhibit where the Seq. No. and the Spacecraft No. (in parenthesis) are listed side by side. The relationship is also shown in Books "A" and "B".

Therefore, the Format Location No. of each will be listed in the order of their occurrence in the data train.

Format Location No.

1. D.42P61-00A107	7. D.42P61-06A110	13. D.42P61-12A110	19. D.42P61-18A110
2. D.42P61-01A108	8. D.42P61-07A110	14. D.42P61-13A110	20. D.42P61-19A110
3. D.42P61-02A109*	9. D.42P61-08A110	15. D.42P61-14A110	21. D.42P61-20A110
4. D.42P61-03A110	10. D.42P61-09A110	16. D.42P61-15A110	22. D.42P61-21A110
5. D.42P61-04A110	11. D.42P61-10A110	17. D.42P61-16A110	23. D.42P61-22A110
6. D.42P61-05A110	12. D.42P61-11A110	18. D.42P61-17A110	24. D.42P61-23A110

* - At present, this location has not been assigned a parameter.

A heavy underline will appear on any visual aid chart which will connect three eight-bit groups. This is meant to indicate that those locations are associated with some twenty-four-bit parameter.

GT-3 One Cycle of "Live" Real Time Data

CHART C

Channel Number →

Frame	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
	←			Odd	Frame				→	←				Even	Frame			→
1 & 2	SYNC	SYNC	SYNC	LA01	EA01	CA03		DG03	EA02	KA01	KA02	AA01	LA01	FA01	X 1	X 2	X 3	EA03
3 & 4	MB03	MA21				MA37	CH04	DG02		KA03		FA02		FA03	X 4	X 5	X 6	
5 & 6	X 7	X 8	X 9			MA17	LB01	DG01		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
7 & 8	MB02	MA38				EC01				KB02		FA02		FA03	AA02	AA02	AA02	
9 & 10	SYNC	SYNC	SYNC			CA04	CA02	JE09		KA01	KA02	AA01		FA01	X 1	X 2	X 3	
11 & 12	HH06	CC03				BG02	CH05	HC02		KA03		FA02		FA03	X 4	X 5	X 6	
13 & 14	X 7	X 8	X 9			DD02	LB03			X 10	X 11	X 12		FA01	X 13	X 14	X 15	
15 & 16	GB05	BD02				EC02		DB06		KB02		FA02		FA03	AA03	AA03	AA03	
17 & 18	SYNC	SYNC	SYNC			CB01	BA04	CA01		KA01	KA02	AA01		FA01	X 1	X 2	X 3	
19 & 20	HH07	CC04				BG03	GC01	HC03		KA03		FA02		FA03	X 4	X 5	X 6	
21 & 22	X 7	X 8	X 9			DD03		CK01		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
23 & 24	CD03	BE01				EC03	CJ01	JC02		KB02		FA02		FA03				
25 & 26	SYNC	SYNC	SYNC			CC01	CL02	BA01		KA01	KA02	AA01		FA01	X 1	X 2	X 3	
27 & 28	HH01	HD03				BG04	GC05	HC04		KA03		FA02		FA03	X 4	X 5	X 6	
29 & 30	X 7	X 8	X 9			DE01	MC01	CK02		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
31 & 32	GB04	BE02				EC04	CJ02			KB02		FA02		FA03	D*01	D*01	D*01	

*Depends on On-Board Computer Mode

GT-3 One Cycle of "Live" Real Time Data

CHART C

Channel Number →

Frame	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
↓	←			Odd	Frame	→				←				Even	Frame	→		
33 & 34	SYNC	SYNC	SYNC	LA01	EA01	CC02	CL03	BA03	EA02	KA01	KA02	AA01	LA01	FA01	X 1	X 2	X 3	EA03
35 & 36	LA02	CB03				DA01	LA06	JC01		KA03		FA02		FA03	X 4	X 5	X 6	
37 & 38	X 7	X 8	X 9			DE02		JE05		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
39 & 40	GB06	BH01				EC05	CL05			KB02		FA02		FA03	D*02	D*02	D*02	
41 & 42	SYNC	SYNC	SYNC			CC06	BA02	QB09		KA01	KA02	AA01		FA01	X 1	X 2	X 3	
43 & 44	GD09	CB02				BG01	LA07	HC01		KA03		FA02		FA03	X 4	X 5	X 6	
45 & 46	X 7	X 8	X 9			DD01		JE01		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
47 & 48	CL08	BH02	PD10			AG06	CJ03			KB02		FA02		FA03	D*03	D*03	D*03	
49 & 50	SYNC	SYNC	SYNC			EB01		DB03		KA01	KA02	AA01		FA01	X 1	X 2	X 3	
51 & 52	LA03	CK06				DA02	LA08	JC03		KA03		FA02		FA03	X 4	X 5	X 6	
53 & 54	X 7	X 8	X 9			DE05		CK03		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
55 & 56	CH02	PD04				NB06	CJ04	CB07		KB02		FA02		FA03	D***	D***	D***	
57 & 58	SYNC	SYNC	SYNC			EB02				KA01	KA02	AA01		FA01	X 1	X 2	X 3	
59 & 60	LA04	MA24				DA03	LA09	JB03		KA03		FA02		FA03	X 4	X 5	X 6	
61 & 62	X 7	X 8	X 9			NA06		CK04		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
63 & 64	CD04	PD06				QB04		MA95		KB02		FA02		FA03	D***	D***	D***	

***Depends on On-Board Computer Mode

GT-3 One Cycle of "Live" Real Time Data

CHART C

Channel Number →

Frame ↓

Frame	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
	←			Odd	Frame				→	←				Even	Frame			→
65 & 66	SYNC	SYNC	SYNC	LA01	EA01	CA03		DG03	EA02	KA01	KA02	AA01	LA01	FA01	X 1	X 2	X 3	EA03
67 & 68	MB03	MA21				MA37	CH04	DG02		KA03		FA02		FA03	X 4	X 5	X 6	
69 & 70	X 7	X 8	X 9			MA17	LB01	DG01		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
71 & 72	GB03	PD08				EC01				KB02		FA02		FA03	D***	D***	D***	
73 & 74	SYNC	SYNC	SYNC			CA04	CA02	JE09		KA01	KA02	AA01		FA01	X 1	X 2	X 3	
75 & 76	HH06	CC03				BG02	CH05	HC02		KA03		FA02		FA03	X 4	X 5	X 6	
77 & 78	X 7	X 8	X 9			DD02	LB03			X 10	X 11	X 12		FA01	X 13	X 14	X 15	
79 & 80	CJ15	PE11				EC02		DB06		KB02		FA02		FA03	D***	D***	D***	
81 & 82	SYNC	SYNC	SYNC			CB01	BA04	CA01		KA01	KA02	AA01		FA01	X 1	X 2	X 3	
83 & 84	HH07	CC04				BG03	GC01	HC03		KA03		FA02		FA03	X 4	X 5	X 6	
85 & 86	X 7	X 8	X 9			DD03		CK01		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
87 & 88	CL06	PE12				EC03	CJ01	JC02		KB02		FA02		FA03	D***	D***	D***	
89 & 90	SYNC	SYNC	SYNC			CC01	CL02	BA01		KA01	KA02	AA01		FA01	X 1	X 2	X 3	
91 & 92	HH01	HD03				BG04	GC05	HC04		KA03		FA02		FA03	X 4	X 5	X 6	
93 & 94	X 7	X 8	X 9			DE01	MC01	CK02		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
95 & 96	CL07	BF01				EC04	CJ02			KB02		FA02		FA03	D***	D***	D***	

GT-3 One Cycle of "Live" Real Time Data

CHART C

Channel Number →

Frame ↓	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
	←			Odd	Frame				→	←				Even	Frame			→
97 & 98	SYNC	SYNC	SYNC	LA01	EA01	CC02	CL03	BA03	EA02	KA01	KA02	AA01	LA01	FA01	X 1	X 2	X 3	EA03
99 & 100	LA02	CB03				DA01	LA06	JC01		KA03		FA02		FA03	X 4	X 5	X 6	
101 & 102	X 7	X 8	X 9			DE02		JE05		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
103 & 104	GB01	BF05				EC05	CL05	QB10		KB02		FA02		FA03	D***	D***	D***	
105 & 106	SYNC	SYNC	SYNC			CC06	BA02			KA01	KA02	AA01		FA01	X 1	X 2	X 3	
107 & 108	GD09	CB02				BG01	LA07	HC01		KA03		FA02		FA03	X 4	X 5	X 6	
109 & 110	X 7	X 8	X 9			DD01		JE01		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
111 & 112	GB02	HA02				AG06	CJ03			KB02		FA02		FA03	D***	D***	D***	
113 & 114	SYNC	SYNC	SYNC			EB01		DB03		KA01	KA02	AA01		FA01	X 1	X 2	X 3	
115 & 116	LA03	CK06	DA02				LA08	JC03		KA03		FA02		FA03	X 4	X 5	X 6	
117 & 118	X 7	X 8	X 9			DE05		CK03		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
119 & 120	GC02	HB02	PD28			NB06	CJ04	CB07		KB02		FA02		FA03	D***	D***	D***	
121 & 122	SYNC	SYNC	SYNC			EB02				KA01	KA02	AA01		FA01	X 1	X 2	X 3	
123 & 124	LA04	MA24				DA03	LA09	JB03		KA03		FA02		FA03	X 4	X 5	X 6	
125 & 126	X 7	X 8	X 9			NA06		CK04		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
127 & 128	GC03	HC05				QB04		MA95		KB02		FA02		FA03	D***	D***	D***	

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GT-3 One Cycle of "Live" Real Time Data

CHART C

Channel Number →

Frame	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
↓	←			Odd	Frame	→				←				Even	Frame	→		
129 & 130	SYNC	SYNC	SYNC	LA01	EA01	CA03	MB01	DG03	EA02	KA01	KA02	AA01	LA01	FA01	X 1	X 2	X 3	EA03
131 & 132	MB03	MA21				MA37	QC14	DG02		KA03		FA02		FA03	X 4	X 5	X 6	
133 & 134	X 7	X 8	X 9			MA17	LB01	DG01		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
135 & 136	GC04	HC06				EC01				KB02		FA02		FA03	D***	D***	D***	
137 & 138	SYNC	SYNC	SYNC			CA04	CA02	LC03		KA01	KA02	AA01		FA01	X 1	X 2	X 3	
139 & 140	HH06	CC03				BG02	QC15	HC02		KA03		FA02		FA03	X 4	X 5	X 6	
141 & 142	X 7	X 8	X 9			DD02	LB03			X 10	X 11	X 12		FA01	X 13	X 14	X 15	
143 & 144	LA05	PC03				EC02		DB06		KB02		FA02		FA03	D***	D***	D***	
145 & 146	SYNC	SYNC	SYNC			CB01	BA04	CA01		KA01	KA02	AA01		FA01	X 1	X 2	X 3	
147 & 148	HH07	CC04				BG03	GC01	HC03		KA03		FA02		FA03	X 4	X 5	X 6	
149 & 150	X 7	X 8	X 9			DD03		SC01		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
151 & 152	LB04	PB05				EC03	CJ01	KC04		KB02		FA02		FA03	D***	D***	D***	
153 & 154	SYNC	SYNC	SYNC			CC01		BA01		KA01	KA02	AA01		FA01	X 1	X 2	X 3	
155 & 156	HH01	HD03				BG04	GC05	HC04		KA03		FA02		FA03	X 4	X 5	X 6	
157 & 158	X 7	X 8	X 9			DE01		SC02		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
159 & 160	MC02	JB02				EC04	CJ02			KB02		FA02		FA03	D*17	D*17	D*17	

GT-3 One Cycle of "Live" Real Time Data

CHART C

Channel Number →

Frame	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
↓	←			Odd	Frame				→	←				Even	Frame			→
161 & 162	SYNC	SYNC	SYNC	LA01	EA01	CC02	CL03	BA03	EA02	KA01	KA02	AA01	LA01	FA01	X 1	X 2	X 3	EA03
163 & 164	LA02	CB03				DA01	LA06	JC01		KA03		FA02		FA03	X 4	X 5	X 6	
165 & 166	X 7	X 8	X 9			DE02		JE05		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
167 & 168	LD01	JB04				EC05	CL05			KB02		FA02		FA03	D***	D***	D***	
169 & 170	SYNC	SYNC	SYNC			CC06	BA02			KA01	KA02	AA01		FA01	X 1	X 2	X 3	
171 & 172	GD09	CB02				BG01	LA07	HC01		KA03		FA02		FA03	X 4	X 5	X 6	
173 & 174	X 7	X 8	X 9			DD01		JE01		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
175 & 176	CM01	BD01				AG06	CJ03			KB02		FA02		FA03	D***	D***	D***	
177 & 178	SYNC	SYNC	SYNC			EB01		DB03		KA01	KA02	AA01		FA01	X 1	X 2	X 3	
179 & 180	LA03	CK06				DA02	LA08	JC03		KA03		FA02		FA03	X 4	X 5	X 6	
181 & 182	X 7	X 8	X 9			DE05		CK03		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
183 & 184		CK05				NB06	CJ04	CB07		KB02		FA02		FA03	D***	D***	D***	
185 & 186	SYNC	SYNC	SYNC			EB02				KA01	KA02	AA01		FA01	X 1	X 2	X 3	
187 & 188	LA04	MA24				DA03	LA09	JB03		KA03		FA02		FA03	X 4	X 5	X 6	
189 & 190	X 7	X 8	X 9			NA06		CK04		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
191 & 192	CH01	JD01				QB04		MA95		KB02		FA02		FA03	D***	D***	D***	

CHART C

GT - 3 One Cycle of "Live" Real Time Data

As the Bilevel parameters (X 1 through X 15 inclusive) are special cases, in that each of these groups contain eight parameters, the Sequence No. for each possible parameter will be shown with the associated group (X 1, X 2, etc.). The parameters in each group will be listed with the most significant bit first and the least significant bit last. Those bits that have not been assigned to a parameter will be left blank.

X 1	X 2	X 3	X 4	X 5
1. AD06	1. BB03	1. AB01	1. AG02	1.
2. AD08	2. BB04	2. AB02	2. AG03	2.
3. AD09	3. BC01	3. AB03	3. AG04	3. CJ05
4. AD10	4. BC02	4. AB04	4. AG09	4. CJ06
5. AF04	5. CE01	5. AB06	5.	5.
6. AE13	6.	6. AD01	6.	6.
7. CC05	7.	7.	7. MA22	7. CE03
8. EB03	8.	8. AD03	8.	8.

X 6	X 7	X 8	X 9	X 10
1. AD04	1. HE01	1. GE01	1. AG10	1. HF01
2. AD05	2. HE02	2. GE02	2. AG11	2. HF02
3. AE01	3. HE03	3. GE03	3. AG12	3. HF03
4. AE02	4. HE04	4. GE04	4.	4. HF04
5.	5. HE05	5. GE05	5. AG05	5. HF05
6.	6. HE06	6. GE06	6. AD02	6. HF06
7. AB07	7. HE07	7. GE07	7. AG16	7. HF07
8.	8. HE08	8. GE08	8.	8. HF08

X 11	X 12	X 13	X 14	X 15
1. GE09	1.	1. AG13	1.	1. AB08
2.	2.	2. AG14	2.	2.
3. GE11	3. BF07	3. AG15	3.	3. AF01
4.	4. BF08	4.	4.	4. AF02
5. GE13	5. BF09	5.	5.	5. AF03
6. GE14	6. BF10	6.	6.	6. DC01
7. GE15	7.	7.	7.	7. DC02
8. GE16	8.	8.	8.	8. DC03

CHART C

GT - 3 One Cycle of "Live" Real Time Data

As twenty-four-bit parameters are a special case, in that the name of a parameter located in a certain location is not always the same (depends on the On-Board Computer Mode), the parameters will be listed in the order of their occurrence for each mode.

Associated Spacecraft No.	Parameter Sequence Number					
	Mode 1 Prelaunch	Mode 2 Ascent	Mode 3 Catch-up	Mode 4 Rendezvous	Mode 5 Re-entry	Mode 6 Touch-down Predict
1. 00A107	AA02	AA02	AA02	AA02	AA02	AA02
2. 01A108	AA03	AA03	AA03	AA03	AA03	AA03
3. 02A109						
4. 03A110	DH01	DJ01	DK01	DL01	DM01	DN01
5. 04A110	DH02	DJ02	DK02	DL02	DM02	DN02
6. 05A110	DH03	DJ03	DK03	DL03	DM03	DN03
7. 06A110	DH07	DJ04	DK04	DL04	DM04	DN04
8. 07A110	DH08	DJ05	DK05	DL05	DM05	DN05
9. 08A110	DH09	DJ06	DK06	DL06	DM06	DN06
10. 09A110	DH13	DJ13	DK13	DL13	DM13	DN07
11. 10A110	DH14	DJ14	DK14	DL14	DM14	DN08
12. 11A110	DH04	DJ07	DK07	DL07	DM07	DN09
13. 12A110	DH05	DJ08	DK08	DL08	DM08	DN10
14. 13A110	DH06	DJ09	DK09	DL09	DM09	DN11
15. 14A110	DH11	DJ10	DK10	DL10	DM10	DN12
16. 15A110	DH10	DJ11	DK11	DL11	DM11	DN13
17. 16A110	DH12	DJ12	DK12	DL12	DM12	DN14
18. 17A110	DH15	DJ15	DK15	DL15	DM16	DN15
19. 18A110	DH16	DJ16	DK16	DL16	DM15	DN16
20. 19A110	DH17	DJ17	DK17	DL17	DM17	DN17
21. 20A110	DH18	DJ18	DK18	DL18	DM19	DN18
22. 21A110	DH19	DJ19	DK19	DL19	DM20	DN19
23. 22A110	DH20	DJ20	DK20	DL20	DM21	DN20
24. 23A110	DH21	DJ21	DK21	DL21	DM18	DN21

GT-3 Parameters Sampled During Any One Cycle of "Live" Data for High Speed (2KBS) Transmission CHART E

Channel Number →

Frame ↓

Frame	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
1						CA03		DG03				AA01	LA01					
2	MB03	MA21				MA37	CH04	DG02										
3						MA17	LB01	DG01										
4	MB02	MA38				EC01									AA02	AA02	AA02	
5						CA04	CA02	JE09				AA01						
6	HH06	CC03				BG02	CH05	HC02										
7						DD02	LB03											
8	GB05	BD02				EC02		DB06							AA03	AA03	AA03	
9						CB01	BA04	CA01				AA01						
10	HH07	CC04				BG03	GC01	HC03										
11						DD03		CK01										
12	CD03	BE01				EC03	CJ01	JC02										
13						CC01	CL02	BA01		KA01	KA02	AA01			X 1	X 2	X 3	
14	HH01	HD03				BG04	GC05	HC04		KA03					X 4	X 5	X 6	
15	X 7	X 8	X 9			DE01	MC01	CK02		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
16	GB04	BE02			EA01	EC04	CJ02		EA02	KB02		FA02		FA03	D*01	D*01	D*01	EA03

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*Depends on On-Board Computer Mode

GT-3 Parameters Sampled During Any One Cycle of "Live" Data for High Speed (2KBS) Transmission CHART E

Channel Number →

Frame	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
17						CC02	CL03	BA03				AA01	LA01					
18	LA02	CB03				DA01	LA06	JC01										
19						DE02		JE05										
20	GB06	BH01				EC05	CL05								D*02	D*02	D*02	
21						CC06	BA02					AA01						
22	GD09	CB02				BG01	LA07	HC01										
23						DD01		JE01										
24	CL08	BH02				AG06	CJ03								D*03	D*03	D*03	
25						EB01		DB03				AA01						
26	LA03	CK06				DA02	LA08	JC03										
27						DE05		CK03										
28	CH02	PD04				NB06	CJ04	CB07							D***	D***	D***	
29						EB02				KA01	KA02	AA01			X 1	X 2	X 3	
30	LA04	MA24				DA03	LA09	JB03		KA03					X 4	X 5	X 6	
31	X 7	X 8	X 9			NA06		CK04		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
32	CD04	PD06			EA01	QB04		MA95	EA02	KB02		FA02		FA03	D***	D***	D***	EA03

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GT-3 Parameters Sampled During Any One Cycle of "Live" Data for High Speed (2KBS) Transmission CHART E

Channel Number →

Frame ↓

Frame	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
33						CA03		DG03				AA01	LA01					
34	MB03	MA21				MA37	CH04	DG02										
35						MA17	LB01	DG01										
36	GB03	PD08				EC01									D***	D***	D***	
37						CA04	CA02	JE09				AA01						
38	HH06	CC03				BG02	CH05	HC02										
39						DD02	LB03											
40	CJ15	PE11				EC02		DB06							D***	D***	D***	
41						CB01	BA04	CA01				AA01						
42	HH07	CC04				BG03	GC01	HC03										
43						DD03		CK01										
44	CL06	PE12				EC03	CJ01	JC02							D***	D***	D***	
45						CC01	CL02	BA01		KA01	KA02	AA01			X 1	X 2	X 3	
46	HH01	HD03				BG04	GC05	HC04		KA03					X 4	X 5	X 6	
47	X 7	X 8	X 9			DE01	MC01	CK02		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
48	CL07	BF01			EA01	EC04	CJ02		EA02	KB02		FA02		FA03	D***	D***	D***	EA03

GT-3 Parameters Sampled During Any One Cycle of "Live" Data for High Speed (2KBS) Transmission CHART E

Channel Number →

Frame	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
49						CC02	CL03	BA03				AA01	LA01					
50	LA02	CB03				DA01	LA06	JC01										
51						DE02		JE05										
52	GB01	BF05				EC05	CL05								D***	D***	D***	
53						CC06	BA02					AA01						
54	GD09	CB02				BG01	LA07	HC01										
55						DD01		JE01										
56	GB02	HA02				AG06	CJ03								D***	D***	D***	
57						EB01		DB03				AA01						
58	LA03	CK06				DA02	LA08	JC03										
59						DE05		CK03										
60	GC02	HB02				NB06	CJ04	CB07							D***	D***	D***	
61						EB02				KA01	KA02	AA01			X 1	X 2	X 3	
62	LA04	MA24				DA03	LA09	JB03		KA03					X 4	X 5	X 6	
63	X 7	X 8	X 9			NA06		CK04		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
64	GC03	HC05			EA01	QB04		MA95	EA02	KB02		FA02		FA03	D***	D***	D***	EA03

GT-3 Parameters Sampled During Any One Cycle of "Live" Data for High Speed (2KBS) Transmission

CHART E

Channel Number →

Frame ↓

Frame	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
65						CA03		DG03				AA01	LA01					
66	MB03	MA21				MA37	CH04	DG02										
67						MA17	LB01	DG01										
68	GC04	HC06				EC01									D***	D***	D***	
69						CA04	CA02	JE09				AA01						
70	HH06	CC03				BG02	CH05	HC02										
71						DD02	LB03											
72	LA05	PC03				EC02		DB06							D***	D***	D***	
73						CB01	BA04	CA01				AA01						
74	HH07	CC04				BG03	GC01	HC03										
75						DD03		CK01										
76	LB04	PB05				EC03	CJ01	JC02							D***	D***	D***	
77						CC01	CL02	BA01		KA01	KA02	AA01			X 1	X 2	X 3	
78	HH01	HD03				BG04	GC05	HC04		KA03					X 4	X 5	X 6	
79	X 7	X 8	X 9			DE01	MC01	CK02		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
80	MC02	JB03			EA01	EC04	CJ02		EA02	KB02		FA02		FA03	D***	D***	D***	EA03

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GT-3 Parameters Sampled During Any One Cycle of "Live" Data for High Speed (2KBS) Transmission

CHART E

Channel Number →

Frame	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
81						CC02	CL03	BA03				AA01	LA01					
82	LA02	CB03				DA01	LA06	JC01										
83						DE02		JE05										
84	LD01	JB04				EC05	CL05								D***	D***	D***	
85						CC06	BA02					AA01						
86	GD09	CB02				BG01	LA07	HC01										
87						DD01		JE01										
88	CM01	BD01				AG06	CJ03								D***	D***	D***	
89						EB01		DB03				AA01						
90	LA03	CK06				DA02	LA08	JC03										
91						DE05		CK03										
92		CK05				NB06	CJ04	CB07							D***	D***	D***	
93						EB02				KA01	KA02	AA01			X 1	X 2	X 3	
94	LA04	MA24				DA03	LA09	JB03		KA03					X 4	X 5	X 6	
95	X 7	X 8	X 9			NA06		CK04		X 10	X 11	X 12		FA01	X 13	X 14	X 15	
96	CH01	JD01			EA01	QB04		MA95	EA02	KB02		FA02		FA03	D***	D***	D***	EA03

CHART F
Master List for High Speed (2 KBS) Transmission

This list reflects the 96 frames of 18 eight-bit words that the TOMCAT-II program will accept during a 2.4 second cycle of "Live" data. The Frame/Channel reference is as before, but to this is added an Input Buffer Reference Address. (IBRA) This reference address is applied only to the coding of the master list that is directly inserted into the TOMCAT-II Program. It will be noted that only approximately 40% of the Frame/Channel locations have been assigned numbers. The locations that are assigned numbers represent all possible locations that might ever be sampled by the TOMCAT-II Program. The numbers that appear in the Frame/Channel locations correspond to the number located in the lower left-hand corner of each block in Chart 2.

Example: The number found in location Frame 1/Channel 64 (1/64-also Input Buffer Reference #12) is 210. Therefore, using the master list principle, whatever parameter is located in that slot from mission to mission will be stored in the Output Buffer location 210. Notice the IBRA uses an octal numbering system.

This method of relocating parameters is followed throughout. This number will occur in three locations as any parameter that is transmitted in that location is repeated twice more. These other locations are Frame 33/Channel 64 and Frame 65/Channel 64. Some parameters are sampled only once, others are sampled six times, and some as high as 96 times.

Some locations have two numbers assigned to them. These parameter locations when sampled are stored in two locations in the Output Buffer. For an example see Frame 15/Channel 4 (15/4), bilevel word X 7, and check Chart 2.

The asterisk (*) found in Channel 33 denotes each time that the MAP word is sampled during a cycle of data. Each time this parameter is sampled it is checked to ascertain whether or not it is a valid MAP, if it is, it is stored in 80 locations in the Output Buffer. Once an invalid MAP has been received twice in sequence after a valid MAP then the unvalid MAP is stored in the 80 locations in the Output Buffer.

The pound symbol (#) denotes the least significant eight-bits of the SET. This parameter is sampled each time it occurs and stored in the Output Buffer 20 times.

This list also reflects the 24 frames of 61 eight-bit words that the TOMCAT-II Program will receive during a 2.4 second cycle of "Dump" data. The Input Buffer Reference Address (IBRA) used to refer to the location of the "Live" data is considerably different when referencing the "Dump" data. Therefore, when considering "Dump" data the IBRA used when referencing the "Live" data should be discarded. Remember that both channels numbered 33 are not included in the inputted data nor are the three SYNC words included. (Reference-Detailed Description of the Data Formats From the Spacecraft - Dump and Figure 3 of this Appendix.) A new IBRA system must be implemented when processing "Dump" data. The system now used is:

> For each "Dump" frame received in the TOMCAT-II Program, 61 eight-bit words are inputted. The last word of each frame received is assigned an IBRA #0, the next to last word of each frame received is assigned an IBRA #1, . . . etc., thru the first word of each frame received is assigned an IBRA #74. This scheme uses an Octal numbering system as did the IBRA scheme for "Live" data.

It will be noticed that when using either of the IBRA schemes for "Live" or "Dump" data that the same Gemini High-Speed (2 KBS) Output Buffer will be generated with regard to parameter location. The one exception in this "Dump" Gemini High-Speed (2 KBS) Output Buffer occurs with the MAP which is not included in the Output Buffer as a result of the fact that that parameter is not included in the inputted data. Those locations reserved for the MAPs in the Output Buffer will be filled with a "Fill Pattern".

Channel ⟶ MASTER LIST FOR HIGH SPEED (2KBS) TRANSMISSION CHART F

"DUMP" FRAME	"LIVE" FRAME	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
		INPUT BUFFER REFERENCE ADDRESS ⟶																	
		21	20	17	16	15	14	13	12	11	10	7	6	5	4	3	2	1	0
1	1						126	26	213				#	*					
	2	436	426	326			432	152	211					*					
	3						423	415	210					*					
	4	300	298	342			216	27	42					*		105	104	103	
2	5						132	125	48				#	*					
	6	102	148	327			116	157	363					*					
	7						198	416	50					*					
	8	316	29	347			217	51	192					*		71 321	70 320	69 319	
3	9						134	52	123				#	*					
	10	375	150	332			117	351	365					*					
	11						200	422	167					*					
	12	45	30	348			222	161	65					*					
4	13						141	177	66		10 260	35 285	#	*		15 265	32 282	47 297	
	14	372	367	334			122	352	366		60 310	247 497		*		63 313	79 329	95 345	
	15	111 361	127 377	142 392			201	438	172		159 409	175 425	191 441	*	114 364	207 457	223 473	239 489	
	16	360	34	350		14 264	225	163	67	39 289	85 335	242 492	139 389	*	164 414	146	145	144	64 314

CHART F

MASTER LIST FOR HIGH SPEED (2KBS) TRANSMISSION

"DUMP" FRAME	"LIVE" FRAME	Channel →	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
		INPUT BUFFER REFERENCE ADDRESS →																		
			21	20	17	16	15	14	13	12	11	10	7	6	5	4	3	2	1	0
5	17							147	182	72				#	*					
	18		398	138	336			186	402	73					*					
	19							202	75	76					*					
	20		373	40	376			226	184	77					*		155	154	153	
6	21							151	82	84				#	*					
	22		357	136	338			115	407	359					*					
	23							197	86	88					*					
	24		382	41	384			101	165	89					*		171	170	169	
7	25							214	90	190				#	*					
	26		400	339	340			188	411	91					*					
	27							209	92	173					*					
	28		54	304	385			440	166	140					*		180	179	178	
8	29							215	417	97		10 260	35 285	#	*		15 265	32 282	47 297	
	30		401	427	341			189	413	98		60 310	247 497		*		63 313	79 329	95 345	
	31		111 361	127 377	142 392			439	100	176		159 409	175 425	191 441	*	114 364	207 457	223 473	239 489	
	32		317	305	386		14 264	442	107	434	39 289	85 335	242 492	139 389	*	164 414	196	195	194	64 314

MASTER LIST FOR HIGH SPEED (2KBS) TRANSMISSION

"DUMP" FRAME	"LIVE" FRAME	Channel → 4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
		INPUT BUFFER REFERENCE ADDRESS →																	
		21	20	17	16	15	14	13	12	11	10	7	6	5	4	3	2	1	0
9	33						126	26	213				#	*					
	34	436	426	326			432	152	211					*					
	35						423	415	210					*					
	36	388	307	390			216	27	42					*		205	204	203	
10	37						132	125	48				#	*					
	38	102	148	327			116	157	363					*					
	39						198	416	50					*					
	40	55	309	391			217	51	192					*		221	220	219	
11	41						134	52	123				#	*					
	42	375	150	332			117	351	365					*					
	43						200	422	167					*					
	44	322	311	397			222	161	65					*		230	229	228	
12	45						141	177	66		10 260	35 285	#	*		15 265	32 282	47 297	
	46	372	367	334			122	352	366		60 310	247 497		*		63 313	79 329	95 345	
	47	111 361	127 377	142 392			201	438	172		159 409	175 425	191 441	*	114 364	207 457	223 473	239 489	
	48	410	36	435		14 264	225	163	67	39 289	85 335	242 492	139 389	*	164 414	246	245	244	64 314

Channel → MASTER LIST FOR HIGH SPEED (2KBS) TRANSMISSION CHART F

"DUMP" FRAME	"LIVE" FRAME	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
		INPUT BUFFER REFERENCE ADDRESS →																	
		21	20	17	16	15	14	13	12	11	10	7	6	5	4	3	2	1	0
13	49						147	182	72				#	*					
	50	398	138	336			186	402	73					*					
	51						202	75	76					*					
	52	59	38	447			226	184	77					*		355	354	353	
14	53						151	82	84				#	*					
	54	357	136	338			115	407	359					*					
	55						197	86	88					*					
	56	61	279	448			101	165	89					*		371	370	369	
15	57						214	90	190				#	*					
	58	400	339	340			188	411	91					*					
	59						209	92	173					*					
	60	276	280	450			440	166	140					*		380	379	378	
16	61						215	417	97		10 260	35 285	#	*		15 265	32 282	47 297	
	62	401	427	341			189	413	98		60 310	247 497		*		63 313	79 329	95 345	
	63	111 361	127 377	142 392			439	100	176		159 409	175 425	191 441	*	114 364	207 457	223 473	239 489	
	64	277	284	451		14 264	442	107	434	39 289	85 335	242 492	139 389	*	164 414	396	395	394	64 314

Channel → MASTER LIST FOR HIGH SPEED (2KBS) TRANSMISSION CHART F

"DUMP" FRAME	"LIVE" FRAME	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
		INPUT BUFFER REFERENCE ADDRESS →																	
↓	↓	21	20	17	16	15	14	13	12	11	10	7	6	5	4	3	2	1	0
17	65						126	26	213				#	*					
	66	436	426	326			432	152	211					*					
	67						423	415	210					*					
	68	278	286	452			216	27	42					*		405	404	403	
18	69						132	125	48				#	*					
	70	102	148	327			116	157	363					*					
	71						198	416	50					*					
	72	292	303	459			217	51	192					*		421	420	419	
19	73						134	52	123				#	*					
	74	375	150	332			117	351	365					*					
	75						200	422	167					*					
	76	294	302	460			222	161	65					*		430	429	428	
20	77						141	177	66		10 260	35 285	#	*		15 265	32 282	47 297	
	78	372	367	334			122	352	366		60 310	247 497		*		63 313	79 329	95 345	
	79	111 361	127 377	142 392			201	438	172		159 409	175 425	191 441	*	114 364	207 457	223 473	239 489	
	80	301	461	463		14 264	225	163	67	39 289	85 335	242 492	139 389	*	164 414	446	445	444	64 314

Channel → MASTER LIST FOR HIGH SPEED (2KBS) TRANSMISSION CHART F

"DUMP" FRAME	"LIVE" FRAME	4	14	24	33	34	44	54	64	74	4	14	24	33	34	44	54	64	74
		INPUT BUFFER REFERENCE ADDRESS →																	
		21	20	17	16	15	14	13	12	11	10	7	6	5	4	3	2	1	0
21	81						147	182	72				#	*					
	82	398	138	336			186	402	73					*					
	83						202	75	76					*					
	84	295	464	465			226	184	77					*		455	454	453	
22	85						151	82	84				#	*					
	86	357	136	338			115	407	359					*					
	87						197	86	88					*					
	88	315	28	466			101	165	89					*		471	470	469	
23	89						214	90	190				#	*					
	90	400	339	340			188	411	91					*					
	91						209	92	173					*					
	92	296	57	467			440	166	140					*		480	479	478	
24	93						215	417	97		10 260	35 285	#	*		15 265	32 282	47 297	
	94	401	427	341			189	413	98		60 310	247 497		*		63 313	79 329	95 345	
	95	111 361	127 377	142 392			439	100	176		159 409	175 425	191 441	*	114 364	207 457	223 473	239 489	
	96	53	472	475		14 264	442	107	434	39 289	85 335	242 492	139 389	*	164 414	496	495	494	64 314

CHART G
SPACECRAFT NUMBERS LOCATED IN SLOTS RESULTING FROM MASTER LIST PRINCIPLE

GEMINI HIGH SPEED (2KBS) OUTPUT BUFFER

SYNC 1	SYNC 2	SYNC 3	ID MSG.LB 4	STATUS WORD 5	A015 6	F 7	A034 8	F 9	A028 10	F 11	A015 12	F 13	A022 14	X1 15	F 16	F 17	A015 18	F 19	F 20	F 21	F 22	F 23	A015 24	F 25
F41 26	F65 27	D30 28	D10 29	D11 30	A015 31	X2 32	A034 33	D12 34	A029 35	D20 36	A015 37	D21 38	A023 39	D13 40	D14 41	A099 42	A015 43	F 44	G11 45	F 46	X3 47	A076 48	A015 49	A092 50
F66 51	F43 52	G32 53	G15 54	G18 55	A015 56	D31 57	A034 58	G21 59	A030 60	G22 61	A015 62	X4 63	A024 64	A101 65	A078 66	A102 67	A015 68	01 69	A1 70	08 71	A079 72	A087 73	A015 74	F61 75
A095 76	A103 77	F 78	X5 79	F 80	A015 81	F46 82	A034 83	A080 84	A032 85	F62 86	A015 87	A096 88	A104 89	F47 90	A089 91	F63 92	A015 93	F 94	X6 95	F 96	A082 97	A090 98	A015 99	F64 100
B70 101	G02 102	00 103	A1 104	07 105	A015 106	F72 107	A034 108	F 109	F 110	X7 111	A015 112	F 113	A025 114	B54 115	B50 116	B51 117	A015 118	F 119	F 120	F 121	B52 122	A077 123	A015 124	F42 125
B41 126	X8 127	F 128	F 129	F 130	A015 131	B42 132	A034 133	B43 134	F 135	D06 136	A015 137	D05 138	A026 139	A105 140	B44 141	X9 142	A015 143	03 144	A1 145	10 146	B45 147	D02 148	A015 149	D03 150
B46 151	F49 152	04 153	A1 154	10 155	A015 156	F50 157	A034 158	X10 159	F 160	F67 161	A015 162	F68 163	A027 164	F70 165	F71 166	A093 167	A015 168	05 169	A1 170	10 171	A094 172	A097 173	A015 174	X11 175
A098 176	F44 177	06 178	A1 179	10 180	A015 181	F45 182	A034 183	F69 184	F 185	B53 186	A015 187	B55 188	B56 189	A081 190	X12 191	A100 192	A015 193	07 194	A1 195	10 196	B62 197	B58 198	A015 199	B59 200
B60 201	B61 202	08 203	A1 204	10 205	A015 206	X13 207	A034 208	B63 209	A091 210	A083 211	A015 212	A075 213	B47 214	B48 215	B65 216	B66 217	A015 218	09 219	A1 220	10 221	B67 222	X14 223	A015 224	B68 225
B69 226	F 227	10 228	A1 229	10 230	A015 231	F 232	A034 233	F 234	F 235	F 236	A015 237	F 238	X15 239	F 240	F 241	A033 242	A015 243	11 244	A1 245	10 246	A031 247	F 248	A015 249	F 250
F 251	F 252	F 253	F 254	F 255	A015 256	F 257	A034 258	F 259	A028 260	F 261	A015 262	F 263	A022 264	X1 265	F 266	F 267	A015 268	F 269	F 270	F 271	F 272	F 273	A015 274	F 275
G23 276	G24 277	G25 278	D22 279	D23 280	A015 281	X2 282	A034 283	D24 284	A029 285	D25 286	A015 287	F 288	A023 289	F 290	F 291	G26 292	A015 293	G27 294	G29 295	G31 296	X3 297	D09 298	A015 299	G09 300
G28 301	D27 302	D26 303	D15 304	D16 305	A015 306	D17 307	A034 308	D18 309	A030 310	D19 311	A015 312	X4 313	A024 314	G30 315	G10 316	G16 317	A015 318	01 319	A1 320	08 321	G19 322	F 323	A015 324	F 325
E01 326	E02 327	F 328	X5 329	F 330	A015 331	E03 332	A034 333	E04 334	A032 335	E05 336	A015 337	E06 338	D07 339	E07 340	E08 341	E09 342	A015 343	F 344	X6 345	F 346	E10 347	E11 348	A015 349	E12 350
F51 351	F52 352	12 353	A1 354	10 355	A015 356	G06 357	A034 358	A088 359	G12 360	X7 361	A015 362	A084 363	A025 364	A085 365	A086 366	D04 367	A015 368	13 369	A1 370	10 371	G04 372	G13 373	A015 374	G03 375
E13 376	X8 377	14 378	A1 379	10 380	A015 381	G14 382	A034 383	E14 384	E15 385	E16 386	A015 387	G17 388	A026 389	E17 390	E18 391	X9 392	A015 393	15 394	A1 395	10 396	E19 397	G05 398	A015 399	G07 400
G08 401	F53 402	16 403	A1 404	10 405	A015 406	F54 407	A034 408	X10 409	G20 410	F55 411	A015 412	F56 413	A027 414	F57 415	F58 416	F48 417	A015 418	17 419	A1 420	10 421	F59 422	B57 423	A015 424	X11 425
D01 426	D08 427	18 428	A1 429	10 430	A015 431	B49 432	A034 433	A106 434	E20 435	G01 436	A015 437	F60 438	B64 439	B71 440	X12 441	B72 442	A015 443	19 444	A1 445	10 446	E21 447	E22 448	A015 449	E23 450
E24 451	E25 452	20 453	A1 454	10 455	A015 456	X13 457	A034 458	E26 459	E27 460	D28 461	A015 462	E28 463	D29 464	E29 465	E30 466	E31 467	A015 468	21 469	A1 470	10 471	D32 472	X14 473	A015 474	E32 475
F 476	F 477	22 478	A1 479	10 480	A015 481	F 482	A034 483	F 484	F 485	F 486	A015 487	F 488	X15 489	F 490	F 491	A033 492	A015 493	23 494	A1 495	10 496	A031 497	F 498	A015 499	F 500

LEGEND: F – FILL PATTERN ▬ 24 – BIT PARAMETER

ATTACHMENT 1

TOMCAT-II Output Information Regarding PCM Confidence Tape #299

Master Lists principle having been applied to the TOMCAT-II Program dictated that some constant format would appear in the 2 Kilobit Output Buffer. This format is outlined in this document. This document will contain the information described in the column headings. All columns should contain the information put there with no changes except to add information where blanks are present. The only exception to this rule is the last column entitled "Seq. No.". This column will more than likely have changes from mission to mission, but they will affect only approximately 20% of the information contained. These changes, naturally, will result in changes in content of the Gemini data stream.

Relative Output Buffer Location	Spacecraft Number	PFS Value	Octal Value	Sequence Number
1			062	Sync
2			353	Sync
3			101	Sync
4			123	ID (MSG LB)
5			Var.	Status Word
6	A015		000 or 377	LA01 (MAP)
7			Var. or 360	Site ID (if used)
8	A034		Var.	AA01 (Least Significant 8 bits of Spacecraft Elapsed Time)
9	F		360	Fill Pattern
10	A028	52	205	KA01
11	F		360	Fill Pattern
12	A015		000 or 377	LA01
13	F		360	Fill Pattern
14	A022	40	146	EA01
15	B01 thru B08		Var.	X 1 (Bilevel Word)
16	F		360	Fill Pattern
17	F		360	Fill Pattern
18	A015		000 or 377	LA01
19	F		360	Fill Pattern
20	F		360	Fill Pattern
21	F		360	Fill Pattern
22	F		360	Fill Pattern
23	F		360	Fill Pattern

Relative Output Buffer Location	Spacecraft Number	PFS Value	Octal Value	Sequence Number
24	A015		000 or 377	LA01
25	F		360	Fill Pattern
26	F41	12	037	G (Garbage)
27	F65	60	231	G
28	D30	88	340	BD01
29	D10	48	172	BD02
30	D11	50	177 or 200	BE01
31	A015		000 or 377	LA01
32	F01 thru F08		Var.	X 2
33	A034		Var.	AA01
34	D12	52	205	BE02
35	A029	54	212	KA02
36	D20	68	255	BF01
37	A015		000 or 377	LA01
38	D21	70	262	BF05
39	A023	42	153	EA02
40	D13	54	212	BH01
41	D14	56	217	BH02
42	A099	32	122	G
43	A015		000 or 377	LA01
44	F		360	Fill Pattern
45	G11	14	044	CD03
46	F		360	Fill Pattern
47	A035 thru A042		Var.	X 3
48	A076	68	255	JE09
49	A015		000 or 377	LA01
50	A092	18	057	G
51	F66	62	236	G
52	F43	16	051	BA04
53	G32	56	217	CH01
54	G15	22	071	CH02
55	G18	28	110	CJ15
56	A015		000 or 377	LA01
57	D31	90	345	CK05
58	A034		Var.	AA01
59	G21	34	127	GB01
60	A030	56	217	KA03
61	G22	36	134	GB02
62	A015		000 or 377	LA01
63	B09 thru B16		Var.	X 4

Relative Output Buffer Location	Spacecraft Number	PFS Value	Octal Value	Sequence Number	
64	A024	44	160	EA03	
65	A101	36	134	JC02	
66	A078	72	267	BA01	
67	A102	38	141	G	
68	A015		000 or 377	LA01	
69	01A108	Hrs.	Var.	AA03	(Time
70	01A108	Min.	Var.	AA03	to
71	01A108	Sec.	Var.	AA03	retrofire)
72	A079	74	274	BA03	
73	A087	90	345	JC01	
74	A015		000 thru 377	LA01	
75	F61	52	205	G	
76	A095	24	076	JE05	
77	A103	40	146	G	
78	F		360	Fill Pattern	
79	F09 thru F16		Var.	X 5	
80	F		360	Fill Pattern	
81	A015		000 or 377	LA01	
82	F46	22	071	BA02	
83	A034		Var.	AA01	
84	A080	76	301	G	
85	A032	60	231	KB02	
86	F62	54	212	G	
87	A015		000 or 377	LA01	
88	A096	26	103	JE01	
89	A104	42	153	G	
90	F47	24	076	G	
91	A089	12	037	JC03	
92	F63	56	217	G	
93	A015		00 or 377	LA01	
94	F		360	Fill Pattern	
95	A043 thru A050		Var.	X 6	
96	F		360	Fill Pattern	
97	A082	80	313	G	
98	A090	14	044	JB03	
99	A015		000 or 377	LA01	
100	F64	58	224	G	
101	B70	24	076	AG06	
102	G02	78	306	HH06	

Relative Output Buffer Location	Spacecraft Number	PFS Value	Octal Value	Sequence Number	
103	00A107	Hrs.	Var.	AA02	(Spacecraft
104	00A107	Min.	Var.	AA02	Elapsed
105	00A107	Sec.	Var.	AA02	Time)
106	A015		000 or 377	LA01	
107	F72	74	274	G	
108	A034		Var.	AA01	
109	F		360	Fill Pattern	
110	F		360	Fill Pattern	
111	B25 thru B32		Var.	X 7	
112	A015		000 or 377	LA01	
113	F		360	Fill Pattern	
114	A025	46	165	FA01	
115	B54	74	274	BG01	
116	B50	66	250	BG02	
117	B51	68	255	BG03	
118	A015		000 or 377	LA01	
119	F		360	Fill Pattern	
120	F		360	Fill Pattern	
121	F		360	Fill Pattern	
122	B52	70	262	BG04	
123	A077	70	262	CA01	
124	A015		000 or 377	LA01	
125	F42	14	044	CA02	
126	B41	48	172	CA03	
127	F25 thru F32		Var.	X 8	
128	F		360	Fill Pattern	
129	F		360	Fill Pattern	
130	F		360	Fill Pattern	
131	A015		000 or 377	LA01	
132	B42	50	177 or 200	CA04	
133	A034		Var.	AA01	
134	B43	52	205	CB01	
135	F		360	Fill Pattern	
136	D06	40	146	CB02	
137	A015		000 or 377	LA01	
138	D05	38	141	CB03	
139	A026	48	172	FA02	
140	A105	44	160	CB07	
141	B44	54	212	CC01	
142	A059 thru A066		Var.	X 9	

Relative Output Buffer Location	Spacecraft Number	PFS Value	Octal Value	Sequence Number	
143	A015		000 or 377	LA01	
144	03A110	?	032	D*01	(* - depends on
145	03A110	?	037	D*01	On-Board
146	03A110	?	044	D*01	Computer Mode)
147	B45	56	217	CC02	
148	D02	32	122	CC03	
149	A015		000 or 377	LA01	
150	D03	34	127	CC04	
151	B46	58	224	CC06	
152	F49	28	110	CH04	
153	04A110	?	051	D*02	
154	04A110	?	057	D*02	
155	04A110	?	064	D*02	
156	A015		000 or 377	LA01	
157	F50	30	115	CH05	
158	A034		Var.	AA01	
159	B33 thru B40		Var.	X 10	
160	F		360	Fill Pattern	
161	F67	64	243	CJ01	
162	A015		000 or 377	LA01	
163	F68	66	250	CJ02	
164	A027	50	177 or 200	FA03	
165	F70	70	262	CJ03	
166	F71	72	267	CJ04	
167	A093	20	064	CK01	
168	A015		000 or 377	LA01	
169	05A110	?	071	D*03	
170	05A110	?	076	D*03	
171	05A110	?	103	D*03	
172	A094	22	071	CK02	
173	A097	28	110	CK03	
174	A015		000 or 377	LA01	
175	F33 thru F40		Var.	X 11	
176	A098	30	115	CK04	
177	F44	18	057	CL02	
178	06A110	?	110	D***	(*** - Depends on
179	06A110	?	115	D***	On-Board
180	06A110	?	122	D***	Computer Mode)
181	A015		000 or 377	LA01	
182	F45	20	064	CL03	

Relative Output Buffer Location	Spacecraft Number	PFS Value	Octal Value	Sequence Number
183	A034		Var.	AA01
184	F69	68	255	CL05
185	F		360	Fill Pattern
186	B53	72	267	DA01
187	A015		000 or 377	LA01
188	B55	76	301	DA02
189	B56	78	306	DA03
190	A081	78	306	DB03
191	A067 thru A074		Var.	X 12
192	A100	34	127	DB06
193	A015		000 or 377	LA01
194	07A110	?	127	D***
195	07A110	?	134	D***
196	07A110	?	141	D***
197	B62	90	345	DD01
198	B58	82	320	DD02
199	A015		000 or 377	LA01
200	B59	84	326	DD03
201	B60	86	333	DE01
202	B61	88	340	DE02
203	08A110	?	146	D***
204	08A110	?	153	D***
205	08A110	?	160	D***
206	A015		000 or 377	LA01
207	B17 thru B24		Var.	X 13
208	A034		Var.	AA01
209	B63	10	032	DE05
210	A091	00	001	DG01
211	A083	???	377	DG02
212	A015		000 or 377	LA01
213	A075	???	377	DG03
214	B47	60	231	EB01
215	B48	62	236	EB02
216	B65	14	044	EC01
217	B66	16	051	EC02
218	A015		000 or 377	LA01
219	09A110	?	165	D***
220	09A110	?	172	D***
221	09A110	?	177	D***
222	B67	18	057	EC03

Relative Output Buffer Location	Spacecraft Number	PFS Value	Octal Value	Sequence Number
223	F17 thru F24		Var.	X 14
224	A015		000 or 377	LA01
225	B68	20	064	EC04
226	B69	22	071	EC05
227	F		360	Fill Pattern
228	10A110	?	205	D***
229	10A110	?	212	D***
230	10A110	?	217	D***
231	A015		000 or 377	LA01
232	F		360	Fill Pattern
233	A034		Var.	AA01
234	F		360	Fill Pattern
235	F		360	Fill Pattern
236	F		360	Fill Pattern
237	A015		000 or 377	LA01
238	F		360	Fill Pattern
239	A051 thru A058		Var.	X 15
240	F		360	Fill Pattern
241	F		360	Fill Pattern
242	A033	62	236	G
243	A015		000 or 377	LA01
244	11A110	?	224	D***
245	11A110	?	231	D***
246	11A110	?	236	D***
247	A031	58	224	G
248	F		360	Fill Pattern
249	A015		000 or 377	LA01
250	F		360	Fill Pattern
251	F		360	Fill Pattern
252	F		360	Fill Pattern
253	F		360	Fill Pattern
254	F		360	Fill Pattern
255	F		360	Fill Pattern
256	A015		000 or 377	LA01
257	F		360	Fill Pattern
258	A034		Var.	AA01
259	F		360	Fill Pattern
260	A028	52	205	KA01
261	F		360	Fill Pattern
262	A015		000 or 377	LA01

Relative Output Buffer Location	Spacecraft Number	PFS Value	Octal Value	Sequence Number
263	F		360	Fill Pattern
264	A022	40	146	EA01
265	B01 thru B08		Var.	X 1
266	F		360	Fill Pattern
267	F		360	Fill Pattern
268	A015		000 or 377	LA01
269	F		360	Fill Pattern
270	F		360	Fill Pattern
271	F		360	Fill Pattern
272	F		360	Fill Pattern
273	F		360	Fill Pattern
274	A015		000 or 377	LA01
275	F		360	Fill Pattern
276	G23	38	141	GC02
277	G24	40	146	GC03
278	G25	42	153	GC04
279	D22	72	267	HA02
280	D23	74	274	HB02
281	A015		000 or 377	LA01
282	F01 thru F08		Var.	X 2
283	A034		Var.	AA01
284	D24	76	301	HC05
285	A029	54	212	KA02
286	D25	78	306	HC06
287	A015		000 or 377	LA01
288	F		360	Fill Pattern
289	A023	42	153	EA02
290	F		360	Fill Pattern
291	F		360	Fill Pattern
292	G26	44	160	LA05
293	A015		000 or 377	LA01
294	G27	46	165	LB04
295	G29	50	177 or 200	LD01
296	G31	54	212	G
297	A035 thru A042		Var.	X 3
298	D09	46	165	MA38
299	A015		000 or 377	LA01
300	G09	10	032	MB02
301	G28	48	172	MC02
302	D27	82	320	PB05

Relative Output Buffer Location	Spacecraft Number	PFS Value	Octal Value	Sequence Number	
303	D26	80	313	PC03	
304	D15	58	224	PD04	
305	D16	60	231	PD06	
306	A015		000 or 377	LA01	
307	D17	62	236	PD08	
308	A034		Var.	AA01	
309	D18	64	243	PE11	
310	A030	56	217	KA03	
311	D19	66	250	PE12	
312	A015		000 or 377	LA01	
313	B09 thru B16		Var.	X 4	
314	A024	44	160	EA03	
315	G30	52	205	CM01	
316	G10	12	037	GB05	
317	G16	24	076	CD04	
318	A015		000 or 377	LA01	
319	01A108	Hrs.	Var.	AA03	(Time
320	01A108	Min.	Var.	AA03	to
321	01A108	Sec.	Var.	AA03	Retrofire)
322	G19	30	115	CL06	
323	F		360	Fill Pattern	
324	A015		000 or 377	LA01	
325	F		360	Fill Pattern	
326	E01	?	?	G	
327	E02	?	?	G	
328	F		360	Fill Pattern	
329	F09 thru F16		Var.	X 5	
330	F		360	Fill Pattern	
331	A015		000 or 377	LA01	
332	E03	?	?	G	
333	A034		Var.	AA01	
334	E04	?	?	G	
335	A032	60	231	KB02	
336	E05	?	?	G	
337	A015		000 or 377	LA01	
338	E06	?	?	G	
339	D07	42	153	CK06	
340	E07	?	?	G	
341	E08	?	?	G	
342	E09	?	?	G	

Relative Output Buffer Location	Spacecraft Number	PFS Value	Octal Value	Sequence Number
343	A015		000 or 377	LA01
344	F		360	Fill Pattern
345	A043 thru A050		Var.	X 6
346	F		360	Fill Pattern
347	E10	?	?	G
348	E11	?	?	G
349	A015		000 or 377	LA01
350	E12	?	?	G
351	F51	32	122	GC01
352	F52	34	127	GC05
353	12A110	?	243	D***
354	12A110	?	250	D***
355	12A110	?	255	D***
356	A015		000 or 377	LA01
357	G06	86	333	GD09
358	A034		Var.	AA01
359	A088	10	032	HC01
360	G12	16	051	GB04
361	B25 thru B32		Var.	X 7
362	A015		000 or 377	LA01
363	A084	84	326	HC02
364	A025	46	165	FA01
365	A085	86	333	HC03
366	A086	88	340	HC04
367	D04	36	134	HD03
368	A015		000 or 377	LA01
369	13A110	?	262	D***
370	13A110	?	267	D***
371	13A110	?	274	D***
372	G04	82	320	HH01
373	G13	18	057	GB06
374	A015		000 or 377	LA01
375	G03	80	313	HH07
376	E13	?	?	G
377	F25 thru F32		Var.	X 8
378	14A110	?	301	D***
379	14A110	?	306	D***
380	14A110	?	313	D***
381	A015		000 or 377	LA01
382	G14	20	064	CL08

Relative Output Buffer Location	Spacecraft Number	PFS Value	Octal Value	Sequence Number
383	A034		Var.	AA01
384	E14	?	?	G
385	E15	?	?	G
386	E16	?	?	G
387	A015		000 or 377	LA01
388	G17	26	103	GB03
389	A026	48	172	FA02
390	E17	?	?	G
391	E18	?	?	G
392	A059 thru A066		Var.	X 9
393	A015		000 or 377	LA01
394	15A110	?	320	D***
395	15A110	?	326	D***
396	15A110	?	333	D***
397	E19	?	?	G
398	G05	84	326	LA02
399	A015		000 or 377	LA01
400	G07	88	340	LA03
401	G08	90	345	LA04
402	F53	36	134	LA06
403	16A110	?	340	D***
404	16A110	?	345	D***
405	16A110	?	032	D***
406	A015		000 or 377	LA01
407	F54	38	141	LA07
408	A034		Var.	AA01
409	B33 thru B40		Var.	X 10
410	G20	32	122	CL07
411	F55	40	146	LA08
412	A015		000 or 377	LA01
413	F56	42	153	LA09
414	A027	50	177 or 200	FA03
415	F57	44	160	LB01
416	F58	46	165	LB03
417	F48	26	103	G
418	A015		000 or 377	LA01
419	17A110	?	037	D***
420	17A110	?	044	D***
421	17A110	?	051	D***
422	F59	48	172	G

Relative Output Buffer Location	Spacecraft Number	PFS Value	Octal Value	Sequence Number
423	B57	80	313	MA17
424	A015		000 or 377	LA01
425	F33 thru F40		Var.	X 11
426	D01	30	115	MA21
427	D08	44	160	MA24
428	18A110	?	057	D***
429	18A110	?	064	D***
430	18A110	?	071	D***
431	A015		000 or 377	LA01
432	B49	64	243	MA37
433	A034		Var.	AA01
434	A106	46	165	MA95
435	E20	?	?	G
436	G01	76	301	MB03
437	A015		000 or 377	LA01
438	F60	50	177 or 200	MC01
439	B64	12	037	NA06
440	B71	26	103	NB06
441	A067 thru A074		Var.	X 12
442	B72	28	110	QB04
443	A015		000 or 377	LA01
444	19A110	?	076	D***
445	19A110	?	103	D***
446	19A110	?	110	D***
447	E21	?	?	G
448	E22	?	?	G
449	A015		000 or 377	LA01
450	E23	?	?	G
451	E24	?	?	G
452	E25	?	?	G
453	20A110	?	115	D***
454	20A110	?	122	D***
455	20A110	?	127	D***
456	A015		000 or 377	LA01
457	B17 thru B24		Var.	X 13
458	A034		Var.	AA01
459	E26	?	?	G
460	E27	?	?	G
461	D28	84	326	JB02
462	A015		000 or 377	LA01

Relative Output Buffer Location	Spacecraft Number	PFS Value	Octal Value	Sequence Number
463	E28	?	?	G
464	D29	86	333	JB04
465	E29	?	?	G
466	E30	?	?	G
467	E31	?	?	G
468	A015		000 or 377	LA01
469	21A110	?	134	D***
470	21A110	?	141	D***
471	21A110	?	146	D***
472	D32	10	032	JD01
473	F17 thru F24		Var.	X 14
474	A015		000 or 377	LA01
475	E32	?	?	G
476	F		360	Fill Pattern
477	F		360	Fill Pattern
478	22A110	?	153	D***
479	22A110	?	160	D***
480	22A110	?	165	D***
481	A015		000 or 377	LA01
482	F		360	Fill Pattern
483	A034		Var.	AA01
484	F		360	Fill Pattern
485	F		360	Fill Pattern
486	F		360	Fill Pattern
487	A015		000 or 377	LA01
488	F		360	Fill Pattern
489	A051 thru A059		Var.	X 15
490	F		360	Fill Pattern
491	F		360	Fill Pattern
492	A033	62	236	G
493	A015		000 or 377	LA01
494	23A110	?	000	D***
495	23A110	?	177	D***
496	23A110	?	205	D***
497	A031	58	224	G
498	F		360	Fill Pattern
499	A015		000 or 377	LA01
500	F		360	Fill Pattern

Var. - When placed beside a Bilevel group of parameters (X 1 thru X 15) means - Bilevels 1 thru 3 and 7 thru 15 change every 5 Min. of a 15 Min. test run --- 0 thru 5 Min. the value is 125 Octal
5 thru 10 Min. the value is 216 Octal
10 thru 15 Min. the value is 063 Octal.
Bilevel groups of parameters labeled X 4, X 5, X 6 are always constant at 001 Octal.

- When placed beside a parameter that is part of the time keeping system means that the clocks should be constantly updating, therefore changing at an unpredictable rate.

? - When under "PFS Value" means print out on RO is unknown.

? - When under "Octal Value" means - do not know value.

00, ???, ??? - as used in locations 210, 211, and 213 represents the PFS Value that would be printed on the RO if these values were presented in this fashion. These three parameters determine the On-Board Computer Mode and when printed on the RO appear as a Bilevel Parameter would be.

F - When under Spacecraft Number means that a Fill Pattern is transmitted in that location and that no Spacecraft Number (parameter) has been assigned to that location.

G - When under Sequence Number means Garbage. Although some information may be known about that particular location, enough is not known to assign it a definite Sequence Number.

APPENDIX B

TOMCAT-II A CORE PROGRAM LISTING

```
MEM. STRG. USED  1064
03000   THRU   03015
03100   THRU   03127
03200   THRU   03252
03400   THRU   03534
04000   THRU   04157
04400   THRU   04507
04600   THRU   04707
04777   THRU   05204
                  0        DJ120    PROG*DESJARDINS*2\27\65
88
03000   00 0000   1        CLOCK    0
03001   50 3000   2                 RIL
03002   57 4626   3                 ISK*CELLC                    TIME TO BUMP CLOCK
03003   55 3000   4                 IJP*CLOCK
03004   75 3014   5                 STRSR*SRSAVE
03005   44 4605   6                 STRAL*AUSAVE+1
03006   70 0177   7                 ENTALK*177                   RESET CLOCK COUNTER
03007   44 4626   10                STRAL*CELLC
03010   12 4600   11                ENTAL*BIGBEN
03011   71 0001   12                ADDALK*1
03012   44 4600   13                STRAL*BIGBEN
03013   12 4605   14                ENTAL*AUSAVE+1
03014   50 7300   15       SRSAVE   ENTSR*0
03015   55 3000   16                IJP*CLOCK
                  17       DJ102    PROG*DESJARDINS*2\27\65
03100   00 0000   20       MINT1    0
03101   50 1107   21                IN*7
03102   00 0000   22       BUFEND   0
03103   00 0000   23       BUFST    0
03104   75 3120   24                STRSR*SRKEEP
03105   44 4603   25                STRAL*AUKEEP+1
03106   12 4620   26                ENTAL*COUNT
03107   71 0001   27                ADDALK*1
03110   44 4620   30                STRAL*COUNT
03111   50 3000   31                RIL
03112   44 4622   32                STRAL*XCOUNT
03113   02 4642   33                CMAL*NSEV
03114   65 3122   34                JPMLEQ*E                     TOO MUCH DATA THIS CYCLE
03115   12 3102   35       I        ENTAL*BUFEND
03116   44 4624   36                STRAL*BUFNOW
03117   12 4603   37                ENTAL*AUKEEP+1
03120   50 7300   40       SRKEEP   ENTSR*0
03121   55 3100   41                IJP*MINT1
03122   40 4673   42       E        CL*VALIDF
03123   70 0001   43                ENTALK*1
03124   44 4623   44                STRAL*IGNORE
```

```
03125  12 4645  45              ENTAL*STATIC
03126  44 1304  46              STRAL*LBUF+5
03127  34 3115  47              JP*1
                50      DJ105   PROG*DESJARDINS*2\27\65
03200  00 0000  51      FINT1   0
03201  50 1107  52              IN*7
03202  20 0521  53              200521
03203  20 0500  54              200500
03204  75 3226  55              STRSR*SRSTOR
03205  44 4611  56              STRAL*AUSTOR+1
03206  12 4620  57              ENTAL*COUNT
03207  02 4641  60              CMAL*NSIX
03210  67 3230  61              JPMGR*STAT          NOT ENOUGH DATA PREVIOUS CYCLE
03211  50 5020  62      F       SKP*20              DATA IS PLAYBACK
03212  34 3236  63              JP*G
03213  12 4625  64              ENTAL*PLAYB
03214  63 3220  65              JPALNZ*J            WHOLE PREVIOUS CYCLE WAS PLAYBACK
03215  70 0001  66              ENTALK*1
03216  44 4625  67              STRAL*PLAYB
03217  34 3241  70              JP*H
03220  12 4623  71      J       ENTAL*IGNORE
03221  63 3224  72              JPALNZ*GETOUT       DATA IS STATIC
03222  12 4631  73              ENTAL*SHAZAM
03223  63 3250  74              JPALNZ*Q            DATA CHANGED FROM BAD TO GOOD
03224  40 4620  75      GETOUT  CL*COUNT
03225  12 4611  76              ENTAL*AUSTOR+1
03226  50 7300  77      SRSTOR  ENTSR*0
03227  54 3200  100             IJPEI*FINT1
03230  40 4673  101     STAT    CL*VALIDF
03231  70 0001  102             ENTALK*1
03232  44 4623  103             STRAL*IGNORE
03233  12 4645  104             ENTAL*STATIC
03234  44 1304  105             STRAL*LBUF+5
03235  34 3211  106             JP*F
03236  12 4625  107     G       ENTAL*PLAYB
03237  61 3220  110             JPALZ*J             WHOLE PREVIOUS CYCLE WAS REAL
03240  40 4625  111             CL*PLAYB
03241  40 4673  112     H       CL*VALIDF
03242  70 0001  113             ENTALK*1
03243  44 4631  114             STRAL*SHAZAM
03244  44 4623  115             STRAL*IGNORE
03245  12 4645  116             ENTAL*STATIC
03246  44 1304  117             STRAL*LBUF+5
03247  34 3224  120             JP*GETOUT
03250  70 0001  121     Q       ENTALK*1
03251  44 4627  122             STRAL*IDFLAG
03252  34 3224  123             JP*GETOUT
```

```
                        124     DJ122   PRUG*DESJARDINS*2\27\65
03400   00 0000         125     MOUT1   0
03401   50 3000         126             RIL
03402   75 3533         127             STRSR*SRHOLD
03403   46 4606         130             STRAU*AUHOLD
03404   44 4607         131             STRAL*AUHOLD+1
03405   12 4630         132             ENTAL*WHICH1
03406   61 3463         133             JPALZ*FIRST                     FINISHED THIRD AREA
03407   02 4616         134             CMAL*EINS
03410   61 3520         135             JPEQ*SECOND                     FINISHED FIRST AREA
03411   12 4600         136     THIRD   ENTAL*BIGBEN
03412   71 0007         137             ADDALK*7
03413   44 4707         140             STRAL*TIMER
03414   76 3422         141             RJP*FIXTR
03415   50 1205         142     DTU1    OUT*5
03416   20 2264         143             202264
03417   20 1776         144             201776
03420   12 4640         145             ENTAL*ZERO
03421   34 3530         146             JP*EXIT
03422   00 0000         147     FIXTR   0
03423   50 5100         150             SKPNBO
03424   34 3425         151             JP*LOK+1
03425   12 4600         152             ENTAL*BIGBEN
03426   44 4676         153             STRAL*HOLDIT
03427   16 4601         154             SUBAL*TIMET
03430   44 4614         155             STRAL*DELTAT
03431   12 4676         156             ENTAL*HOLDIT
03432   44 4601         157             STRAL*TIMET
03433   10 1406         160             ENTAU*LBUF+71D
03434   50 4310         161             RSHA*8D
03435   10 1405         162             ENTAU*LBUF+70D
03436   50 4310         163             RSHA*8D
03437   10 1404         164             ENTAU*LBUF+69D
03440   50 4302         165             RSHA*2
03441   22 4614         166             SUBA*DELTAT
03442   50 5100         167             SKPNBO
03443   22 4616         170             SUBA*EINS
03444   50 4702         171             LSHA*2
03445   46 4612         172             STRAU*ASTORE
03446   10 4640         173             ENTAU*ZERO
03447   50 4710         174             LSHA*8D
03450   46 1405         175             STRAU*LBUF+70D
03451   46 1777         176             STRAU*LBUF+320D
03452   10 4640         177             ENTAU*ZERO
03453   50 4710         200             LSHA*8D
03454   46 1406         201             STRAU*LBUF+71D
03455   46 2000         202             STRAU*LBUF+321D
```

```
03456  12 4612  203              ENTAL*ASTORE
03457  52 4653  204              SLCL*SAFETY
03460  44 1404  205              STRAL*LBUF+69D
03461  44 1776  206              STRAL*LBUF+319D
03462  55 3422  207              IJP*FIXTR
03463  12 4600  210     FIRST    ENTAL*BIGBEN
03464  71 0004  211              ADDALK*4
03465  44 4707  212              STRAL*TIMER
03466  57 4673  213              ISK*VALIDF
03467  34 3471  214              JP*LOK+2
03470  34 3475  215              JP*A
03471  12 4673  216              ENTAL*VALIDF
03472  63 3475  217              JPALNZ*A
03473  12 4677  220              ENTAL*DATAOK
03474  44 1304  221              STRAL*LBUF+5
03475  57 4700  222     A        ISK*LOSF
03476  34 3500  223              JP*LOK+2
03477  34 3513  224              JP*B
03500  12 4700  225              ENTAL*LOSF
03501  63 3505  226              JPALNZ*N
03502  12 4633  227              ENTAL*STORAL
03503  10 4632  230              ENTAU*STORAU
03504  34 4777  231              JP*PAUSE
03505  10 1303  232     N        ENTAU*LBUF+4
03506  50 4301  233              RSHA*1
03507  50 6100  234              CPAL
03510  50 4321  235              RSHA*17D
03511  51 4701  236              SLSET*BIT7
03512  44 1303  237              STRAL*LBUF+4
03513  50 1205  240     B        OUT*5
03514  20 1404  241              201404
03515  20 1300  242              201300
03516  70 0001  243              ENTALK*1
03517  34 3530  244              JP*EXIT
03520  12 4600  245     SECOND   ENTAL*BIGBEN
03521  71 0012  246              ADDALK*12
03522  44 4707  247              STRAL*TIMER
03523  76 3422  250              RJP*FIXTR
03524  50 1205  251     DTU2     OUT*5
03525  20 1776  252              201776
03526  20 1404  253              201404
03527  70 0002  254              ENTALK*2
03530  44 4630  255     EXIT     STRAL*WHICH1
03531  10 4606  256              ENTAU*AUHOLD
03532  12 4607  257              ENTAL*AUHOLD+1
03533  50 7300  260     SRHOLD   ENTSR*0
03534  55 3400  261              IJP*MOUT1
```

```
                        262     DJ114   PROG*DESJARDINS*2\13\65
04000   12 4620         263     EXEC1   ENTAL*COUNT
04001   02 4621         264             CMAL*MCOUNT
04002   61 4007         265             JPEQ*S
04003   70 2000         266             ENTALK*2000
04004   44 4702         267             STRAL*KNTR
04005   12 4620         270             ENTAL*COUNT
04006   34 4050         271             JP*M
04007   57 4702         272     S       ISK*KNTR
04010   34 4020         273             JP*ASTAT
04011   40 4673         274             CL*VALIDF
04012   12 4645         275             ENTAL*STATIC
04013   44 1304         276             STRAL*LBUF+5
04014   70 0001         277             ENTALK*1
04015   44 4623         300             STRAL*IGNORE
04016   44 4674         301             STRAL*FILMAP
04017   30 4675         302             IRJP*GOLIST
04020   12 4707         303     ASTAT   ENTAL*TIMER
04021   02 4600         304             CMAL*BIGBEN
04022   65 4043         305             JPMLEQ*W
04023   40 4673         306             CL*VALIDF
04024   12 4645         307             ENTAL*STATIC
04025   44 1304         310             STRAL*LBUF+5
04026   70 0001         311             ENTALK*1
04027   44 4623         312             STRAL*IGNORE
04030   44 4674         313             STRAL*FILMAP
04031   30 4675         314             IRJP*GOLIST
04032   12 4662         315             ENTAL*STCON
04033   44 0033         316     X       STRAL*33
04034   50 2705         317             EXFOV*5
04035   50 1705         320             EXFSTP*5
04036   50 2705         321             EXFOV*5
04037   50 1705         322             EXFSTP*5
04040   12 4600         323             ENTAL*BIGBEN
04041   71 0012         324             ADDALK*12
04042   44 4707         325             STRAL*TIMER
04043   50 5001         326     W       SKP*1
04044   34 4000         327             JP*EXEC1
04045   70 0002         330             ENTALK*2
04046   44 4700         331             STRAL*LOSF
04047   34 4000         332             JP*EXEC1
04050   44 4621         333     M       STRAL*MCOUNT
04051   63 4073         334             JPALNZ*C                COUNT IS NOT ZERO
04052   12 4627         335             ENTAL*IDFLAG
04053   63 4133         336             JPALNZ*FIXID            IDFLAG IS SET
04054   12 4636         337     R       ENTAL*G2S
04055   44 3103         340             STRAL*BUFST
```

```
04056  12 4637  341          ENTAL*G2E
04057  44 3102  342          STRAL*BUFEND
04060  12 4623  343          ENTAL*IGNORE
04061  63 4064  344          JPALNZ*T
04062  30 4675  345          IRJP*GOLIST
04063  34 4000  346          JP*EXEC1
04064  70 0003  347  T       ENTALK*3
04065  44 4673  350          STRAL*VALIDF
04066  70 0001  351          ENTALK*1
04067  44 4674  352          STRAL*FILMAP
04070  30 4675  353          IRJP*GOLIST
04071  40 4623  354          CL*IGNORE
04072  34 4000  355          JP*EXEC1
04073  12 4623  356  C       ENTAL*IGNORE
04074  63 4000  357          JPALNZ*EXEC1          IGNORE IS SET
04075  12 4624  360          ENTAL*BUFNOW
04076  02 4635  361          CMAL*G1E
04077  63 4105  362          JPNOT*SETUP1          CURRENT BUFFER IS 2
04100  12 4636  363          ENTAL*G2S
04101  44 3103  364          STRAL*BUFST
04102  12 4637  365          ENTAL*G2E
04103  44 3102  366          STRAL*BUFEND
04104  34 4111  367          JP*D
04105  12 4634  370  SETUP1  ENTAL*G1S
04106  44 3103  371          STRAL*BUFST
04107  12 4635  372          ENTAL*G1E
04110  44 3102  373          STRAL*BUFEND
04111  50 5020  374  D       SKP*20                DATA IS PLAYBACK
04112  34 4127  375          JP*DREAL
04113  12 4625  376          ENTAL*PLAYB
04114  61 4117  377          JPALZ*CHANGE
04115  30 4675  400          IRJP*GOLIST
04116  34 4000  401          JP*EXEC1
04117  70 0001  402  CHANGE  ENTALK*1
04120  44 4623  403          STRAL*IGNORE
04121  44 4674  404          STRAL*FILMAP
04122  40 4673  405          CL*VALIDF
04123  12 4645  406          ENTAL*STATIC
04124  44 1304  407          STRAL*LBUF+5
04125  30 4675  410          IRJP*GOLIST
04126  34 4000  411          JP*EXEC1
04127  12 4625  412  DREAL   ENTAL*PLAYB
04130  63 4117  413          JPALNZ*CHANGE         SOME OF CYCLE IS PLAYBACK
04131  30 4675  414          IRJP*GOLIST
04132  34 4000  415          JP*EXEC1
04133  12 4625  416  FIXID   ENTAL*PLAYB
04134  61 4156  417          JPALZ*L               DATA IS REAL
```

```
04135  12 4643  420            ENTAL*PBID
04136  44 1303  421     K      STRAL*LBUF+4
04137  70 0002  422            ENTALK*2
04140  44 4673  423            STRAL*VALIDF
04141  50 2205  424     U      SKPOIN*5
04142  34 4153  425            JP*V
04143  50 1205  426            OUT*5
04144  20 1404  427            201404
04145  20 1300  430            201300
04146  12 4600  431            ENTAL*BIGBEN
04147  71 0004  432            ADDALK*4
04150  44 4707  433            STRAL*TIMER
04151  70 0001  434            ENTALK*1
04152  44 4630  435            STRAL*WHICH1
04153  40 4631  436     V      CL*SHAZAM
04154  40 4627  437            CL*IDFLAG
04155  34 4054  440            JP*R
04156  12 4644  441     L      ENTAL*RID
04157  34 4136  442            JP*K
               443     DJ111B PROG*DESJARDINS*15SEPTEMBER1964TABLE
04400  20 1404  444     T69D   20*LBUF+69D
04401  20 1405  445     T70D   20*LBUF+70D
04402  20 1406  446     T71D   20*LBUF+71D
04403  20 1446  447     T103D  20*LBUF+103D
04404  20 1447  450     T104D  20*LBUF+104D
04405  20 1450  451     T105D  20*LBUF+105D
04406  20 1517  452     T144D  20*LBUF+144D
04407  20 1520  453     T145D  20*LBUF+145D
04410  20 1521  454     T146D  20*LBUF+146D
04411  20 1530  455     T153D  20*LBUF+153D
04412  20 1531  456     T154D  20*LBUF+154D
04413  20 1532  457     T155D  20*LBUF+155D
04414  20 1550  460     T169D  20*LBUF+169D
04415  20 1551  461     T170D  20*LBUF+170D
04416  20 1552  462     T171D  20*LBUF+171D
04417  20 1561  463     T178D  20*LBUF+178D
04420  20 1562  464     T179D  20*LBUF+179D
04421  20 1563  465     T180D  20*LBUF+180D
04422  20 1601  466     T194D  20*LBUF+194D
04423  20 1602  467     T195D  20*LBUF+195D
04424  20 1603  470     T196D  20*LBUF+196D
04425  20 1612  471     T203D  20*LBUF+203D
04426  20 1613  472     T204D  20*LBUF+204D
04427  20 1614  473     T205D  20*LBUF+205D
04430  20 1632  474     T219D  20*LBUF+219D
04431  20 1633  475     T220D  20*LBUF+220D
04432  20 1634  476     T221D  20*LBUF+221D
```

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04433  20 1643  477      T228D   20*LBUF+228D
04434  20 1644  500      T229D   20*LBUF+229D
04435  20 1645  501      T230D   20*LBUF+230D
04436  20 1663  502      T244D   20*LBUF+244D
04437  20 1664  503      T245D   20*LBUF+245D
04440  20 1665  504      T246D   20*LBUF+246D
04441  20 1776  505      T319D   20*LBUF+319D
04442  20 1777  506      T320D   20*LBUF+320D
04443  20 2000  507      T321D   20*LBUF+321D
04444  20 2040  510      T353D   20*LBUF+353D
04445  20 2041  511      T354D   20*LBUF+354D
04446  20 2042  512      T355D   20*LBUF+355D
04447  20 2060  513      T369D   20*LBUF+369D
04450  20 2061  514      T370D   20*LBUF+370D
04451  20 2062  515      T371D   20*LBUF+371D
04452  20 2071  516      T378D   20*LBUF+378D
04453  20 2072  517      T379D   20*LBUF+379D
04454  20 2073  520      T380D   20*LBUF+380D
04455  20 2111  521      T394D   20*LBUF+394D
04456  20 2112  522      T395D   20*LBUF+395D
04457  20 2113  523      T396D   20*LBUF+396D
04460  20 2122  524      T403D   20*LBUF+403D
04461  20 2123  525      T404D   20*LBUF+404D
04462  20 2124  526      T405D   20*LBUF+405D
04463  20 2142  527      T419D   20*LBUF+419D
04464  20 2143  530      T420D   20*LBUF+420D
04465  20 2144  531      T421D   20*LBUF+421D
04466  20 2153  532      T428D   20*LBUF+428D
04467  20 2154  533      T429D   20*LBUF+429D
04470  20 2155  534      T430D   20*LBUF+430D
04471  20 2173  535      T444D   20*LBUF+444D
04472  20 2174  536      T445D   20*LBUF+445D
04473  20 2175  537      T446D   20*LBUF+446D
04474  20 2204  540      T453D   20*LBUF+453D
04475  20 2205  541      T454D   20*LBUF+454D
04476  20 2206  542      T455D   20*LBUF+455D
04477  20 2224  543      T469D   20*LBUF+469D
04500  20 2225  544      T470D   20*LBUF+470D
04501  20 2226  545      T471D   20*LBUF+471D
04502  20 2235  546      T478D   20*LBUF+478D
04503  20 2236  547      T479D   20*LBUF+479D
04504  20 2237  550      T480D   20*LBUF+480D
04505  20 2255  551      T494D   20*LBUF+494D
04506  20 2256  552      T495D   20*LBUF+495D
04507  20 2257  553      T496D   20*LBUF+496D
                554      DJ119   PROG*DESJARDINS*2\13\65
04600  00 0000  555      BIGBEN  0
```

```
04601  00 0000  556     TIMET   0
04602  00 0000  557     AUKEEP  0
04603  00 0000  560             0
04604  00 0000  561     AUSAVE  0
04605  00 0000  562             0
04606  00 0000  563     AUHOLD  0
04607  00 0000  564             0
04610  00 0000  565     AUSTOR  0
04611  00 0000  566             0
04612  00 0000  567     ASTORE  0
04613  00 0000  570             0
04614  00 0000  571     DELTAT  0
04615  00 0000  572             0
04616  00 0001  573     EINS    1
04617  00 0000  574             0
04620  00 0000  575     COUNT   0
04621  00 0000  576     MCOUNT  0
04622  00 0000  577     XCOUNT  0
04623  00 0000  600     IGNORE  0
04624  00 0000  601     BUFNOW  0
04625  00 0000  602     PLAYB   0
04626  00 0000  603     CELLC   0
04627  00 0000  604     IDFLAG  0
04630  00 0000  605     WHICH1  0
04631  00 0000  606     SHAZAM  0
04632  00 0000  607     STORAU  0
04633  00 0000  610     STORAL  0
04634  20 0500  611     G1S     200500
04635  20 0521  612     G1E     200521
04636  20 0522  613     G2S     200522
04637  20 0543  614     G2E     200543
04640  00 0000  615     ZERO    0
04641  00 0140  616     NSIX    96D
04642  00 0141  617     NSEV    97D
04643  00 0123  620     PBID    123
04644  00 0022  621     RID     22
04645  00 0377  622     STATIC  377
04646  00 0360  623     PATTRN  360
04647  00 0062  624     SYNC    62
04650  00 0353  625             353
04651  00 0101  626             101
04652  00 0007  627     SRMASK  7
04653  77 7377  630     SAFETY  777377
04654  00 0400  631     DTUOFF  400
04655  50 7300  632     XENTSR  ENTSR*0
04656  76 3200  633     FINT1J  RJP*FINT1
04657  76 3100  634     MINT1J  RJP*MINT1
```

143 FOR GTI
42 FOR GTI

```
04660  76 3400  635     MOUT1J  RJP*MOUT1
04661  76 3000  636     CLOCKJ  RJP*CLOCK
04662  00 4663  637     STCON   0*LOK+1
04663  00 0001  640             1
04664  00 0002  641             2
04665  00 0000  642     BUFCR   0
04666  00 0000  643     TEMP    0
04667  00 0000  644             0
04670  00 0000  645             0
04671  00 0000  646             0
04672  00 0000  647             0
04673  00 0000  650     VALIDF  0
04674  00 0000  651     FILMAP  0
04675  01 0000  652     GOLIST  10000
04676  00 0000  653     HOLDIT  0
04677  00 0000  654     DATAOK  0
04700  00 0000  655     LOSF    0
04701  00 0200  656     BIT7    200
04702  00 0000  657     KNTR    0
04703  00 0000  660     SITEID  0
04704  00 0000  661     MAPPAT  0
04705  00 0377  662     MUP     377
04706  00 0377  663     MASK2   377
04707  00 0000  664     TIMER   0
               665     DJ117   PROG*DESJARDINS*2\13\65
04777  50 5640  666     PAUSE   STOP
05000  50 3400  667     BEGIN1  SIL
05001  46 4632  670             STRAU*STORAU
05002  44 4633  671             STRAL*STORAL
05003  50 7202  672             ENTICR*2
05004  12 4646  673             ENTAL*PATTRN
05005  36 0763  674             ENTBK*499D
05006  45 1300  675             STRALB*LBUF+1
05007  73 5006  676             BJP*LOK-1
05010  36 0043  677             ENTBK*35D
05011  45 0500  700             STRALB*500
05012  73 5011  701             BJP*LOK-1
05013  12 4647  702             ENTAL*SYNC
05014  44 1300  703             STRAL*LBUF+1
05015  12 4650  704             ENTAL*SYNC+1
05016  44 1301  705             STRAL*LBUF+2
05017  12 4651  706             ENTAL*SYNC+2
05020  44 1302  707             STRAL*LBUF+3
05021  50 5020  710             SKP*20                  SKIP KEY 4 IS SET
05022  34 5030  711             JP*LOK+6
05023  12 4643  712             ENTAL*PBID
05024  44 1303  713             STRAL*LBUF+4
```

```
05025  70 0001  714          ENTALK*1
05026  44 4625  715          STRAL*PLAYB
05027  34 5033  716          JP*LOK+4
05030  12 4644  717          ENTAL*RID
05031  44 1383  720          STRAL*LBUF+4
05032  40 4625  721          CL*PLAYB
05033  12 4645  722          ENTAL*STATIC
05034  44 1304  723          STRAL*LBUF+5
05035  12 4703  724          ENTAL*SITEID
05036  44 1306  725          STRAL*LBUF+7
05037  70 0177  726          ENTALK*177
05040  44 4626  727          STRAL*CELLC
05041  70 3777  730          ENTALK*3777
05042  44 4707  731          STRAL*TIMER
05043  40 4600  732          CL*BIGBEN
05044  40 4601  733          CL*TIMET
05045  40 4666  734          CL*TEMP
05046  40 4667  735          CL*TEMP+1
05047  40 4670  736          CL*TEMP+2
05050  40 4671  737          CL*TEMP+3
05051  40 4672  740          CL*TEMP+4
05052  40 4673  741          CL*VALIDF
05053  40 4700  742          CL*LOSF
05054  40 4702  743          CL*KNTR
05055  70 0001  744          ENTALK*1
05056  44 4623  745          STRAL*IGNORE
05057  44 4631  746          STRAL*SHAZAM
05060  44 4620  747          STRAL*COUNT
05061  44 4621  750          STRAL*MCOUNT
05062  12 4634  751          ENTAL*G1S
05063  44 3103  752          STRAL*BUFST
05064  12 4635  753          ENTAL*G1E
05065  44 3102  754          STRAL*BUFEND
05066  44 4624  755          STRAL*BUFNOW
05067  36 0057  756          ENTBK*57
05070  41 0020  757          CLB*20
05071  73 5070  760          BJP*LOK-1
05072  36 0077  761          ENTBK*77
05073  12 5201  762          ENTAL*PUTRIL
05074  45 0100  763          STRALB*100
05075  73 5074  764          BJP*LOK-1
05076  12 4632  765          ENTAL*STORAU
05077  52 4652  766          SLCL*SRMASK
05100  63 5102  767          JPALNZ*FIXDTU
05101  70 0005  770          ENTALK*5
05102  44 4632  771  FIXDTU   STRAL*STORAU
05103  14 4655  772          ADDAL*XENTSR
```

```
05104  44 5105  773            STRAL*LOK+1
05105  00 0000  774            0
05106  75 3415  775            STRSR*DTU1
05107  75 3513  776            STRSR*B
05110  75 3524  777            STRSR*DTU2
05111  75 5175  1000           STRSR*DTU3
05112  75 5176  1001           STRSR*DTU3+1
05113  75 5177  1002           STRSR*DTU3+2
05114  75 5200  1003           STRSR*DTU3+3
05115  75 4141  1004           STRSR*U
05116  75 4143  1005           STRSR*U+2
05117  75 4034  1006           STRSR*X+1
05120  75 4035  1007           STRSR*X+2
05121  75 4036  1010           STRSR*X+3
05122  75 4037  1011           STRSR*X+4
05123  12 4632  1012           ENTAL*STORAU
05124  50 4601  1013           LSHAL*1
05125  71 0021  1014           ADDALK*21
05126  74 5174  1015           STRADR*DTUON+1
05127  74 4033  1016           STRADR*X
05130  12 4632  1017           ENTAL*STORAU
05131  50 4601  1020           LSHAL*1
05132  71 0140  1021           ADDALK*140
05133  74 5170  1022           STRADR*FIXINT+5
05134  12 4632  1023           ENTAL*STORAU
05135  50 4601  1024           LSHAL*1
05136  71 0041  1025           ADDALK*41
05137  44 4665  1026           STRAL*BUFCR
05140  70 0002  1027           ENTALK*2
05141  44 4674  1030           STRAL*FILMAP
05142  30 4675  1031           IRJP*GOLIST
05143  12 4633  1032  P        ENTAL*STORAL
05144  52 4652  1033           SLCL*SRMASK
05145  63 5147  1034           JPALNZ*FIXPCM
05146  70 0007  1035           ENTALK*7
05147  44 4633  1036  FIXPCM   STRAL*STORAL
05150  14 4655  1037           ADDAL*XENTSR
05151  44 5152  1040           STRAL*LOK+1
05152  00 0000  1041           0
05153  75 3201  1042           STRSR*FINT1+1
05154  75 3101  1043           STRSR*MINT1+1
05155  12 4633  1044           ENTAL*STORAL
05156  50 4601  1045           LSHAL*1
05157  71 0100  1046           ADDALK*100
05160  74 5164  1047           STRADR*FIXINT+1
05161  71 0060  1050           ADDALK*60
05162  74 5166  1051           STRADR*FIXINT+3
```

```
05[illegible]  [illegible] 4656  1052     FIXINT   ENTAL*FINT1J
05[illegible]  44 0116  1053              STRAL*116
05[illegible]  12 4657  1054              ENTAL*MINT1J
05[illegible]  44 0176  1055              STRAL*176
05[illegible]  12 4660  1056              ENTAL*MOUT1J
05170  44 0152  1057              STRAL*152
05171  12 4661  1060              ENTAL*CLOCKJ
05172  44 0016  1061              STRAL*16
05173  12 4662  1062     DTUON    ENTAL*STCON
05174  44 0033  1063              STRAL*33
05175  50 2705  1064     DTU3     EXFOV*5
05176  50 1705  1065              EXFSTP*5
05177  50 2705  1066              EXFOV*5
05200  50 1705  1067              EXFSTP*5
05201  50 3000  1070     PUTRIL   RIL
05202  12 4705  1071              ENTAL*MUP
05203  44 4704  1072              STRAL*MAPPAT
05204  34 4000  1073              JP*EXEC1


23 5153
```

APPENDIX C

TOMCAT-II B PROGRAM LISTING

```
MEM. STRG. USED  2528
04000  THRU  04314
04777  THRU  07206
                        C       CORE    PROG*GUION*20MAY1965
88
04000   20 1204   1            T69D    20*LBUF+69D
04001   20 1205   2            T70D    20*LBUF+70D
04002   20 1206   3            T71D    20*LBUF+71D
04003   20 1246   4            T103D   20*LBUF+103D
04004   20 1247   5            T104D   20*LBUF+104D
04005   20 1250   6            T105D   20*LBUF+105D
04006   20 1317   7            T144D   20*LBUF+144D
04007   20 1320   10           T145D   20*LBUF+145D
04010   20 1321   11           T146D   20*LBUF+146D
04011   20 1330   12           T153D   20*LBUF+153D
04012   20 1331   13           T154D   20*LBUF+154D
04013   20 1332   14           T155D   20*LBUF+155D
04014   20 1350   15           T169D   20*LBUF+169D
04015   20 1351   16           T170D   20*LBUF+170D
04016   20 1352   17           T171D   20*LBUF+171D
04017   20 1361   20           T178D   20*LBUF+178D
04020   20 1362   21           T179D   20*LBUF+179D
04021   20 1363   22           T180D   20*LBUF+180D
04022   20 1401   23           T194D   20*LBUF+194D
04023   20 1402   24           T195D   20*LBUF+195D
04024   20 1403   25           T196D   20*LBUF+196D
04025   20 1412   26           T203D   20*LBUF+203D
04026   20 1413   27           T204D   20*LBUF+204D
04027   20 1414   30           T205D   20*LBUF+205D
04030   20 1432   31           T219D   20*LBUF+219D
04031   20 1433   32           T220D   20*LBUF+220D
04032   20 1434   33           T221D   20*LBUF+221D
04033   20 1443   34           T228D   20*LBUF+228D
04034   20 1444   35           T229D   20*LBUF+229D
04035   20 1445   36           T230D   20*LBUF+230D
04036   20 1463   37           T244D   20*LBUF+244D
04037   20 1464   40           T245D   20*LBUF+245D
04040   20 1465   41           T246D   20*LBUF+246D
04041   20 1576   42           T319D   20*LBUF+319D
04042   20 1577   43           T320D   20*LBUF+320D
04043   20 1600   44           T321D   20*LBUF+321D
04044   20 1640   45           T353D   20*LBUF+353D
04045   20 1641   46           T354D   20*LBUF+354D
04046   20 1642   47           T355D   20*LBUF+355D
04047   20 1660   50           T369D   20*LBUF+369D
04050   20 1661   51           T370D   20*LBUF+370D
04051   20 1662   52           T371D   20*LBUF+371D
```

```
04052  20 1671  53      T378D   20*LBUF+378D
04053  20 1672  54      T379D   20*LBUF+379D
04054  20 1673  55      T380D   20*LBUF+380D
04055  20 1711  56      T394D   20*LBUF+394D
04056  20 1712  57      T395D   20*LBUF+395D
04057  20 1713  60      T396D   20*LBUF+396D
04060  20 1722  61      T403D   20*LBUF+403D
04061  20 1723  62      T404D   20*LBUF+404D
04062  20 1724  63      T405D   20*LBUF+405D
04063  20 1742  64      T419D   20*LBUF+419D
04064  20 1743  65      T420D   20*LBUF+420D
04065  20 1744  66      T421D   20*LBUF+421D
04066  20 1753  67      T428D   20*LBUF+428D
04067  20 1754  70      T429D   20*LBUF+429D
04070  20 1755  71      T430D   20*LBUF+430D
04071  20 1773  72      T444D   20*LBUF+444D
04072  20 1774  73      T445D   20*LBUF+445D
04073  20 1775  74      T446D   20*LBUF+446D
04074  20 2004  75      T453D   20*LBUF+453D
04075  20 2005  76      T454D   20*LBUF+454D
04076  20 2006  77      T455D   20*LBUF+455D
04077  20 2024  100     T469D   20*LBUF+469D
04100  20 2025  101     T470D   20*LBUF+470D
04101  20 2026  102     T471D   20*LBUF+471D
04102  20 2035  103     T478D   20*LBUF+478D
04103  20 2036  104     T479D   20*LBUF+479D
04104  20 2037  105     T480D   20*LBUF+480D
04105  20 2055  106     T494D   20*LBUF+494D
04106  20 2056  107     T495D   20*LBUF+495D
04107  20 2057  110     T496D   20*LBUF+496D
04110  00 0000  111     FILMAP  0
04111  00 0000  112     BUFCR   0
04112  00 0000  113     TEMP    0
04113  00 0000  114             0
04114  00 0000  115             0
04115  00 0000  116             0
04116  00 0000  117             0
04117  00 0000  120     TIMET   0
04120  00 0000  121     BIGBEN  0
04121  00 0000  122     TIKTOK  0
04122  00 0001  123     EINS    1
04123  00 0000  124             0
04124  00 0000  125     DELTAT  0
04125  00 0000  126             0
04126  00 0000  127     CELLB   0
04127  00 0000  130     CELLC   0
04130  00 0000  131     ALSAV1  0
```

```
04131  00 0000  132     FINTF   0
04132  00 0000  133     MINTF   0
04133  00 0000  134     SENDF   0*0
04134  00 0000  135     CHANGE  0
04135  00 0000  136     COUNT   0
04136  00 0000  137     XCOUNT  0
04137  00 0000  140     NUMBER  0
04140  00 0000  141     IGNOR1  0
04141  00 0000  142     IGNOR2  0
04142  00 0000  143     IGNORF  0
04143  00 0000  144     GOLIST  0
04144  00 0000  145     VALIDF  0
04145  00 0000  146     BUFNOW  0
04146  00 0000  147     BUFNUM  0
04147  00 0000  150     BUFLAG  0
04150  00 0000  151     LENGTH  0
04151  00 0000  152     CNTROL  0
04152  00 0000  153     SAVE    0
04153  00 0000  154     ALSAVE  0
04154  00 0000  155     INCLOK  0
04155  00 0000  156     REAL    0
04156  00 0000  157     PLAYB   0
04157  00 0000  160     STARTF  0
04160  00 0000  161     LOSF    0
04161  00 0000  162     LOSIF   0
04162  00 0000  163     ALSAV4  0*0
04163  00 0000  164     WHICH1  0
04164  00 0000  165     HOLDIT  0
04165  00 0000  166     AUSAVE  0
04166  00 0000  167     STORAL  0
04167  00 0000  170     STORAU  0
04170  00 0000  171     TIMER   0
04171  00 0000  172     GEMINI  0
04172  00 0000  173     XFLAG   0
04173  00 0000  174     YFLAG   0
04174  00 0000  175     XBUF    0
04175  00 0000  176     YBUF    0
04176  00 0000  177     CHANLX  0
04177  00 0000  200     CHANLY  0
04200  00 0000  201     CHANNL  0
04201  00 0000  202     NCHANL  0
04202  00 0000  203     NODATF  0
04203  00 0000  204     MINTJ   0
04204  00 0140  205     GRNUM   96D
04205  00 0030  206     GDNUM   24D
04206  00 0020  207     ANUM    16D
04207  01 0030  210     GRLIST  10006
```

```
04210  02 0000  211      GDLIST  20000
04211  03 0000  212      ALIST   30000
04212  20 0300  213      G1S     200300
04213  20 0400  214      G2S     200400
04214  00 0002  215      GRPART  2D
04215  00 0010  216      GDPART  8D
04216  00 0005  217      APART   5D
04217  00 0021  220      GRBUF   17D
04220  00 0074  221      GDBUF   60D
04221  00 0174  222      ABUF    124D
04222  20 0500  223      A1S     200500
04223  20 0700  224      A2S     200700
04224  00 0360  225      PATTRN  360
04225  00 0200  226      STATIC  200
04226  20 0310  227      GR1AE   200310
04227  20 0304  230      GD1AE   200304
04230  20 0530  231      A1AE    200530
04231  00 0200  232      BIT7    200
04232  00 0400  233      BIT8    400
04233  00 0000  234      ZERO    0
04234  76 0377  235      SAFETY  760377
04235  00 0022  236      GRID    22
04236  00 0123  237      GDID    123
04237  00 0024  240      ARID    24
04240  00 0125  241      ADID    125
04241  76 6766  242      MOUJU   RJP*MOUTU
04242  00 0013  243      XONPR   13
04243  00 0011  244      XOFFPR  11
04244  40 0000  245      ADBIT   400000
04245  20 0000  246      ARBIT   200000
04246  10 0000  247      GDBIT   100000
04247  04 0000  250      GRBIT   40000
04250  02 0000  251      BIT13   20000
04251  50 3000  252      PUTRIL  RIL
04252  00 0000  253      MAPPAT  0
04253  00 0377  254      MUP     377
04254  00 0300  255      DATAUM  300
04255  00 0007  256      ICRMSK  7
04256  50 7200  257      MASK1   ENTICR
04257  00 0060  260      FDMASK  60
04260  76 5530  261      CLOCKJ  RJP*CLOCK
04261  00 0000  262      MOUTJ   0
04262  76 5564  263      FINTJ   RJP*FINT
04263  76 5741  264      MINJBR  RJP*MINTBR
04264  76 5612  265      MINJC   RJP*MINTC
04265  76 5000  266      MINJA   RJP*MINTA
04266  00 0002  267      GSYNC   02
```

```
  3 IF TEX
102 IF TEX
  5 IF TEX
104 IF TEX
```

```
04267  00 0353  270            353
04270  00 0101  271            101
04271  00 0260  272   ASYNC    260
04272  00 0255  273            255
04273  00 0316  274            316
04274  00 0000  275            0*0
04275  00 0000  276            0*0
04276  00 0000  277            0*0
04277  00 0000  300   VALID6   0
04300  00 0000  301   ALSAV2   0
04301  00 0000  302   AUSAV2   0
04302  00 0000  303   NODATG   0
04303  00 0000  304   SWITCH   0
04304  00 4305  305   YDTUON   0*LOK+1
04305  00 0001  306            1
04306  00 0002  307            2
04307  00 0377  310   MASK2    377
04310  00 0000  311   ALSAV3   0
04311  74 0000  312   MASK3    740000
04312  00 0000  313   CLOCK1   0
04313  00 0000  314   CHNGE1   0
04314  76 7042  315   MOUJGR   RJP*MOUTGR
04777  50 5640  316   PAUSE    STOP
05000  50 3400  317   BEGIN1   SIL
05001  46 4167  320            STRAU*STORAU     SAVE AU AND AL REGISTERS
05002  44 4166  321            STRAL*STORAL
05003  12 4167  322            ENTAL*STORAU     WAS LS DIGIT OF AU ZERO
05004  52 4255  323            SLCL*ICRMSK
05005  63 5007  324            JPALNZ*FIXOUT    NO
05006  70 0005  325            ENTALK*5         SET AL   5
05007  44 4167  326   FIXOUT   STRAL*STORAU     SET STORAU   OUTPUT CHANNEL
05010  51 4256  327            SLSET*MASK1      PREPARE TO FIX OUTPUT
05011  44 5012  330            STRAL*LOK+1            CHANNEL NUMBERS
05012  00 0000  331            0
05013  72 7033  332            STRICR*XC2       FIX OUTPUT CHANNEL NUMBERS
05014  72 7124  333            STRICR*XC4
05015  72 7135  334            STRICR*SECOND+4
05016  72 7057  335            STRICR*THIRD+4
05017  72 6357  336            STRICR*XL3+1
05020  72 6363  337            STRICR*XL5
05021  72 5170  340            STRICR*DTUON+2
05022  72 5174  341            STRICR*XH1
05023  12 4167  342            ENTAL*STORAU     BRING IN OUTPUT CHANNEL NUMBER
05024  50 4601  343            LSHAL*1          MULTIPLY BY 2
05025  71 0021  344            ADDALK*21        PUT 21+2K
05026  74 6356  345            STRADR*XL3
05027  74 5167  346            STRADR*DTUON+1
```

```
05030  71 0020  347                ADDALK*20                PUT 41+2K
05031  74 4111  350                STRADR*BUFCR
05032  71 0077  351                ADDALK*77                PUT 140+2K
05033  74 5500  352                STRADR*XM1
05034  10 4166  353                ENTAU*STORAL             BRING LS DIGIT TO AL
05035  50 4303  354                RSHA*3
05036  10 4233  355                ENTAU*ZERO
05037  50 4317  356                RSHA*15D                 IS AL EQUAL TO ZERO
05040  63 5045  357                JPALNZ*LOOK+5            NO
05041  70 0007  360                ENTALK*7                 SET CHANLY TO 7
05042  44 4177  361                STRAL*CHANLY
05043  70 0006  362                ENTALK*6                 SET CHANLX TO 6
05044  34 5064  363                JP*H1
05045  44 4177  364                STRAL*CHANLY             SET CHANLY TO AL
05046  10 4166  365                ENTAU*STORAL             BRING NEXT DIGIT TO AL
05047  50 4306  366                RSHA*6
05050  10 4233  367                ENTAU*ZERO
05051  50 4317  370                RSHA*15D                 IS AL EQUAL TO ZERO
05052  63 5064  371                JPALNZ*H1                NO,SET CHANLX TO AL
05053  70 0007  372                ENTALK*7                 WAS CHANLY EQUAL TO 7
05054  02 4177  373                CMAL*CHANLY
05055  61 5063  374                JPEQ*H1-1                YES
05056  12 4177  375                ENTAL*CHANLY             SET CHANLX TO CHANLY
05057  44 4176  376                STRAL*CHANLX
05060  70 0007  377                ENTALK*7                 SET CHANLY TO 7
05061  44 4177  400                STRAL*CHANLY
05062  34 5065  401                JP*H1+1
05063  70 0006  402                ENTALK*6                 SET CHANLX TO 6
05064  44 4176  403          H1    STRAL*CHANLX
05065  12 4176  404                ENTAL*CHANLX             BRING IN CHANLX
05066  50 4603  405                LSHAL*3                  SET UP STORAL
05067  51 4177  406                SLSET*CHANLY
05070  44 4166  407                STRAL*STORAL
05071  12 4176  410                ENTAL*CHANLX
05072  50 4601  411                LSHAL*1                  MULTIPLY BY 2
05073  71 0100  412                ADDALK*100               PUT 100+2X
05074  74 6413  413                STRADR*XE1
05075  71 0060  414                ADDALK*60                PUT 160+2X
05076  74 6416  415                STRADR*XE1+3
05077  74 6446  416                STRADR*XE3
05100  12 4177  417                ENTAL*CHANLY             BRING IN CHANLY
05101  50 4601  420                LSHAL*1                  MULTIPLY BY 2
05102  71 0160  421                ADDALK*100               PUT 100+2Y
05103  74 6414  422                STRADR*XE1+1
05104  71 0060  423                ADDALK*60                PUT 160+2Y
05105  74 6420  424                STRADR*XE1+5
05106  74 6447  425                STRADR*XE3+1
```

```
05107  12 417c  426        ENTAL*CHANLX
0511c  51 4257  427        SLSET*FDMASK
05111  44 6736  430        STRAL*MESS2+23
05112  12 4177  431        ENTAL*CHANLY
05113  51 4257  432        SLSET*FDMASK
05114  44 6753  433        STRAL*MESS2+40
05115  12 417c  434        ENTAL*CHANLX
05116  51 4256  435        SLSET*MASK1
05117  44 5120  436        STRAL*LOK+1
05120  00 0000  437        0
05121  72 6423  440        STRICR*XE2
05122  72 6410  441        STRICR*SEARCH
05123  12 4177  442        ENTAL*CHANLY
05124  51 4256  443        SLSET*MASK1
05125  44 5126  444        STRAL*LOK+1
05126  00 0000  445        0
05127  72 6426  446        STRICR*XE2+3
05130  72 6411  447        STRICR*SEARCH+1
05131  40 4120  450        CL*BIGBEN
05132  40 4121  451        CL*TIKTOK
05133  40 4160  452        CL*LOSF
05134  40 4161  453        CL*LOS1F
05135  40 4110  454        CL*FILMAP
05136  40 4163  455        CL*WHICH1
05137  40 4303  456        CL*SWITCH
05140  70 0001  457        ENTALK*1
05141  44 4313  460        STRAL*CHNGE1
05142  44 4127  461        STRAL*CELLC
05143  44 4157  462        STRAL*STARTF
05144  70 0003  463        ENTALK*3
05145  44 4202  464        STRAL*NODATF
05146  44 4302  465        STRAL*NODATG
05147  70 0077  466        ENTALK*77
05150  44 4126  467        STRAL*CELLB
05151  70 3777  470        ENTALK*3777
05152  44 4154  471        STRAL*INCLOK
05153  44 4170  472        STRAL*TIMER
05154  50 7202  473        ENTICR*2
05155  36 0057  474        ENTBK*57
05156  41 0020  475        CLB*20
05157  73 5156  476        BJP*LOK-1
05160  36 0077  477        ENTBK*77
05161  12 4251  500        ENTAL*PUTRIL
05162  45 0100  501        STRALR*100
05163  73 5162  502        BJP*LOK-1
05164  12 4260  503        ENTAL*CLOCKJ
05165  44 001c  504        STRAL*16
```

PUT FD CODE FOR X IN MESS2

PUT FD CODE FOR Y IN MESS2

PREPARE TO PUT X

PUT X

PREPARE TO PUT Y

PUT Y

CLEAR FLAGS

SET FLAGS

CLEAR BUFFER CONTROL REGISTERS

PUT RIL*. IN INTERRUPT ENTRANCE REGISTERS

PUT RJP*CLOCK IN SYNCHRONIZING INTERRUPT ENTRANCE REGISTERS

```
05166  12 4304  505      DTUON   ENTAL*YDTUON          PUT ADDRESS OF DTU CONTROL
05167  74 0000  506              STRADR                     WORDS IN EF BUFFER CONTROL
05170  50 2700  507              EXFOV                 __   REGISTER, AND FORCE THEM OUT
05171  12 6407  510              ENTAL*L4              PUT ADDRESS OF L4
05172  12 5171  511              ENTAL*LOK-1
05173  74 6404  512              STRADR*L8-1
05174  50 2700  513      XH1     EXFOV
05175  12 6271  514              ENTAL*L12             PUT ADDRESS OF L12
05176  12 5175  515              ENTAL*LOK-1
05177  74 6266  516              STRADR*L7-1
05200  76 6157  517              RJP*WATCH             WATCHDOG SUBROUTINE
05201  34 6410  520              JP*SEARCH
05202  40 4120  521      BEGIN2  CL*BIGBEN             CLEAR SELECTED LOCATIONS
05203  40 4132  522              CL*MINTF
05204  40 4135  523              CL*COUNT
05205  40 4117  524              CL*TIMET
05206  40 4131  525              CL*FINTF
05207  40 4134  526              CL*CHANGE
05210  40 4121  527              CL*TIKTOK
05211  40 4144  530              CL*VALIDF
05212  40 4277  531              CL*VALID8
05213  40 4140  532              CL*IGNOR1
05214  40 4112  533              CL*TEMP
05215  40 4113  534              CL*TEMP+1
05216  40 4114  535              CL*TEMP+2
05217  40 4115  536              CL*TEMP+3
05220  40 4116  537              CL*TEMP+4
05221  40 4110  540              CL*FILMAP
05222  70 0001  541              ENTALK*1              SET FLAGS
05223  44 4127  542              STRAL*CELLC
05224  44 4141  543              STRAL*IGNOR2
05225  44 4142  544              STRAL*IGNORF
05226  70 0003  545              ENTALK*3
05227  44 4202  546              STRAL*NODATF
05230  44 4302  547              STRAL*NODATG
05231  70 0077  550              ENTALK*77
05232  44 4126  551              STRAL*CELLB
05233  12 4225  552              ENTAL*STATIC          SET BAD BUFFER FLAG
05234  44 1104  553              STRAL*LBUF+5
05235  12 4253  554              ENTAL*MUP
05236  44 4252  555              STRAL*MAPPAT
05237  12 4200  556              ENTAL*CHANNL          PREPARE TO PUT K
05240  51 4256  557              SLSET*MASK1
05241  44 5242  560              STRAL*LOK+1
05242  00 0000  561              0                     PUT K
05243  72 5750  562              STRICR*XB1
05244  72 6002  563              STRICR*XB4
```

```
05245  72 5754  564          STRICR*XB5
05246  72 5762  565          STRICR*XB6
05247  72 6033  566          STRICR*XD1
05250  72 6037  567          STRICR*XD2
05251  72 6043  570          STRICR*XD3
05252  72 6047  571          STRICR*XD4
05253  72 6053  572          STRICR*XD5
05254  72 6057  573          STRICR*XD6
05255  72 6063  574          STRICR*XD7
05256  72 6027  575          STRICR*XD10
05257  72 6117  576          STRICR*XD11
05260  72 6123  577          STRICR*XD12
05261  72 6127  600          STRICR*XD13
05262  72 6133  601          STRICR*XD14
05263  72 6033  602          STRICR*XD1
05264  72 6143  603          STRICR*XD16
05265  72 6147  604          STRICR*XD17
05266  72 6077  605          STRICR*XD20
05267  72 5561  606          STRICR*FINT+1
05270  12 4201  607          ENTAL*NCHANL          PREPARE TO PUT K*
05271  51 4256  610          SLSET*MASK1
05272  44 5273  611          STRAL*LOK+1
05273  00 0000  612          0                     PUT K*
05274  72 6316  613          STRICR*XL1
05275  72 6316  614          STRICR*XL2
05276  72 6324  615          STRICR*XL4
05277  50 7202  616          ENTICR*2
05300  12 4200  617          ENTAL*CHANNL          BRING IN K
05301  50 4601  620          LSHAL*1               MULTIPLY BY 2
05302  71 0100  621          ADDALK*100            PUT 100+2K
05303  74 5510  622          STRADR*XM3
05304  71 0060  623          ADDALK*60             PUT 160+2K
05305  74 5503  624          STRADR*XM2
05306  12 4201  625          ENTAL*NCHANL          BRING IN K*
05307  50 4601  626          LSHAL*1               MULTIPLY BY 2
05310  71 0100  627          ADDALK*100            PUT 100+2K*
05311  74 5315  630          STRADR*XM4
05312  71 0060  631          ADDALK*60             PUT 160+2K*
05313  74 5316  632          STRADR*XM4+1
05314  12 4251  633          ENTAL*PUTRIL          PUT RIL*
05315  44 0000  634  XM4     STRAL
05316  44 0000  635          STRAL
05317  57 4303  636          ISK*SWITCH            IS CHANGE CHANNEL SWITCH SET
05320  34 5502  637          JP*M1                 YES
05321  36 0577  640          ENTBK*577             CLEAR INPUT BUFFER AREA
05322  41 0300  641          CLR*300
05323  73 5322  642          BJP*LOK-1
```

```
05324  30 0756  643          ENTBK*756          FILL OUTPUT BUFFER AREA WITH
05325  12 4224  644          ENTAL*PATTRN                 FILL PATTERN
05326  45 1105  645          STRAL*LBUF+6
05327  73 5326  646          BJP*LOK-1
05330  12 6405  647          ENTAL*L8           PUT ADDRESS OF L8
05331  12 5330  650          ENTAL*LOK-1
05332  74 6404  651          STRADR*L8-1
05333  12 6267  652          ENTAL*L7           PUT ADDRESS OF L7
05334  12 5333  653          ENTAL*LOK-1
05335  74 6266  654          STRADR*L7-1
05336  12 4171  655          ENTAL*GEMINI       IS THE DATA GEMINI
05337  61 5432  656          JPALZ*FIXAG        NO
05340  12 4212  657  FIXGEM   ENTAL*G1S          PUT ADDRESS OF G1S
05341  12 5340  660          ENTAL*LOK-1
05342  74 5705  661          STRADR*XB3
05343  12 4213  662          ENTAL*G2S          PUT ADDRESS OF G2S
05344  12 5343  663          ENTAL*LOK-1
05345  74 5703  664          STRADR*XB2
05346  12 4235  665          ENTAL*GRID         PUT ADDRESS OF GRID
05347  12 5346  666          ENTAL*LOK-1
05350  74 5623  667          STRADR*XA1
05351  12 4236  670          ENTAL*GDID         PUT ADDRESS OF GDID
05352  12 5351  671          ENTAL*LOK-1
05353  74 5625  672          STRADR*XA1+2
05354  12 4212  673          ENTAL*G1S          PUT G1S
05355  44 5563  674          STRAL*FINT+3
05356  12 4266  675          ENTAL*GSYNC        PUT SYNC CODE IN OUTPUT BUFFER
05357  44 1100  676          STRAL*LBUF+1
05360  12 4267  677          ENTAL*GSYNC+1
05361  44 1101  700          STRAL*LBUF+2
05362  12 4270  701          ENTAL*GSYNC+2
05363  44 1102  702          STRAL*LBUF+3
05364  12 4155  703          ENTAL*REAL         IS THE DATA REAL-TIME
05365  61 5410  704          JPALZ*FIXGD        NO
05366  12 4226  705  FIXGR    ENTAL*GRIAE        PUT GRIAE
05367  44 5562  706          STRAL*FINT+2
05370  12 4207  707          ENTAL*GRLIST       PUT GRLIST
05371  44 4143  710          STRAL*GOLIST
05372  70 0002  711          ENTALK*2           INITIALIZE LISTGR
05373  44 4110  712          STRAL*FILMAP
05374  30 4143  713          IRJP*GOLIST
05375  12 4204  714          ENTAL*GRNUM        PUT GRNUM
05376  44 4137  715          STRAL*NUMBER
05377  12 4214  716          ENTAL*GRPART       PUT GRPART
05400  44 4146  717          STRAL*BUFNUM
05401  12 4217  720          ENTAL*GRBUF        PUT GRBUF
05402  44 4150  721          STRAL*LENGTH
```

```
05403  12 4314  722          ENTAL*MOUJGR
05404  44 4261  723          STRAL*MOUTJ
05405  12 4263  724          ENTAL*MINJGR
05406  44 4203  725          STRAL*MINTJ
05407  34 5477  726          JP*M2
05410  12 4227  727  FIXGD    ENTAL*GD1AE
05411  44 5562  730          STRAL*FINT+2
05412  12 4210  731          ENTAL*GDLIST
05413  44 4143  732          STRAL*GOLIST
05414  70 0002  733          ENTALK*2
05415  44 4110  734          STRAL*FILMAP
05416  30 4143  735          IRJP*GOLIST
05417  12 4205  736          ENTAL*GDNUM
05420  44 4137  737          STRAL*NUMBER
05421  12 4215  740          ENTAL*GDPART
05422  44 4146  741          STRAL*BUFNUM
05423  12 4220  742          ENTAL*GDBUF
05424  44 4150  743          STRAL*LENGTH
05425  12 4241  744          ENTAL*MOUJU
05426  44 4261  745          STRAL*MOUTJ
05427  12 4264  746          ENTAL*MINJGD
05430  44 4203  747          STRAL*MINTJ
05431  34 5477  750          JP*M2
05432  12 4222  751  FIXAG    ENTAL*A1S
05433  12 5432  752          ENTAL*LOK-1
05434  74 5705  753          STRADR*XB3
05435  12 4223  754          ENTAL*A2S
05436  12 5435  755          ENTAL*LOK-1
05437  74 5703  756          STRADR*XB2
05440  12 4237  757          ENTAL*ARID
05441  12 5440  760          ENTAL*LOK-1
05442  74 5623  761          STRADR*XA1
05443  12 4240  762          ENTAL*ADID
05444  12 5443  763          ENTAL*LOK-1
05445  74 5625  764          STRADR*XA1+2
05446  12 4222  765          ENTAL*A1S
05447  44 5563  766          STRAL*FINT+3
05450  12 4271  767          ENTAL*ASYNC
05451  44 1100  770          STRAL*LBUF+1
05452  12 4272  771          ENTAL*ASYNC+1
05453  44 1101  772          STRAL*LBUF+2
05454  12 4273  773          ENTAL*ASYNC+2
05455  44 1102  774          STRAL*LBUF+3
05456  12 4230  775          ENTAL*A1AE
05457  44 5562  776          STRAL*FINT+2
05460  12 4211  777          ENTAL*ALIST
05461  44 4143  1000         STRAL*GOLIST
```

```
PUT RJP*MOUTGR

PUT RJP*MINTGR


PUT GD1AE

PUT GDLIST

INITIALIZE LISTGD


PUT GDNUM

PUT GDPART

PUT GDBUF

PUT RJP*MOUTU

PUT RJP*MINTGD


PUT ADDRESS OF A1S


PUT ADDRESS OF A2S


PUT ADDRESS OF ARID


PUT ADDRESS OF ADID


PUT A1S

PUT SYNC CODE IN OUTPUT BUFFER




PUT A1AE

PUT ALIST
```

```
05541  70 0001  1060          ENTALK*1
05542  44 4127  1061          STRAL*CELLC
05543  34 5555  1062          JP*J2
05544  57 4126  1063  J1      ISK*CELLB
05545  55 5530  1064          IJP*CLOCK
05546  75 5556  1065          STRSR*JSRSAV
05547  44 4130  1066          STRAL*ALSAV1
05550  12 4120  1067          ENTAL*BIGBEN
05551  71 0001  1070          ADDALK*1
05552  44 4120  1071          STRAL*BIGBEN
05553  70 0077  1072          ENTALK*77
05554  44 4126  1073          STRAL*CELLB
05555  12 4130  1074  J2      ENTAL*ALSAV1
05556  50 7300  1075  JSRSAV  ENTSR
05557  55 5530  1076          IJP*CLOCK
05560  00 0000  1077  FINT    0
05561  50 1100  1100          IN
05562  00 0000  1101          0
05563  00 0000  1102          0
05564  75 5571  1103          STRSR*ASRSAV
05565  44 4153  1104          STRAL*ALSAVE
05566  70 0001  1105          ENTALK*1
05567  44 4131  1106          STRAL*FINTF
05570  12 4153  1107          ENTAL*ALSAVE
05571  50 7300  1110  ASRSAV  ENTSR
05572  55 5560  1111          IJPEI*FINT
05573  00 0000  1112  FINTP   0
05574  12 4135  1113          ENTAL*COUNT
05575  02 4137  1114          CMAL*NUMBER
05576  65 5607  1115          JPMLEQ*A4
05577  40 4144  1116          CL*VALIDF
05600  40 4277  1117          CL*VALID8
05601  12 4225  1120          ENTAL*STATIC
05602  44 1104  1121          STRAL*LBUF+5
05603  70 0001  1122          ENTALK*1
05604  44 4140  1123          STRAL*IGNOR1
05605  44 4110  1124          STRAL*FILMAP
05606  30 4143  1125          IRJP*GOLIST
05607  57 4140  1126  A4      ISK*IGNOR1
05610  34 5614  1127          JP*LOK+4
05611  57 4141  1130          ISK*IGNOR2
05612  34 5617  1131          JP*LOK+5
05613  34 5632  1132          JP*A1
05614  57 4141  1133          ISK*IGNOR2
05615  34 5617  1134          JP*LOK+2
05616  34 5627  1135          JP*A2
05617  12 4155  1136          ENTAL*REAL
```

```
SET CELLC   1

IS IT TIME TO INCREMENT BIGBEN
NO
SAVE REGISTERS

INCREMENT BIGBEN

SET CELLB   77

RESTORE REGISTERS

FRAME GATE RESET INTERRUPT SUBROUTINE
INITIATE INPUT BUFFER 1A

SAVE REGISTERS

SET FINT FLAG

RESTORE REGISTERS

RETURN TO PROGRAM
FRAME GATE INTERRUPT PROCESSOR SUBROUTINE
IS COUNT LESS THAN NUMBER

NO
CLEAR VALID BUFFER FLAG
CLEAR VALIDATE BUFFER FLAG
SET BAD BUFFER FLAG

SET IGNOR1 FLAG

PUT PATTERN IN MAP LOCATIONS

IS IGNOR1 EQUAL TO ZERO
NO
IS IGNOR2 EQUAL TO ZERO
NO
YES
ISK IGNOR2 EQUAL TO ZERO
NO
YES
IS REAL FLAG SET
```

```
05462  70 0002  1001          ENTALK*2          INITIALIZE LISTA
05463  44 411C  1002          STRAL*FILMAP
05464  30 4143  1003          IRJP*GOLIST
05465  12 420C  1004          ENTAL*ANUM        PUT ANUM
05466  44 4137  1005          STRAL*NUMBER
05467  12 4216  1006          ENTAL*APART       PUT APART
05470  44 4146  1007          STRAL*BUFNUM
05471  12 4221  1010          ENTAL*ABUF        PUT ABUF
05472  44 4150  1011          STRAL*LENGTH
05473  12 4241  1012          ENTAL*MOUJU       PUT RJP*MOUTU
05474  44 4261  1013          STRAL*MOUTJ
05475  12 4265  1014          ENTAL*MINJA       PUT RJP*MINTA
05476  44 4203  1015          STRAL*MINTJ
05477  12 4261  1016  M2      ENTAL*MOUTJ       FILL OUTPUT MONITOR INTERRUPT
05500  44 0000  1017  XM1     STRAL                         ENTRANCE REGISTER
05501  44 5636  1020          STRAL*XA2
05502  12 4203  1021  M1      ENTAL*MINTJ       FILL INPUT MONITOR INTERRUPT
05503  44 0000  1022  XM2     STRAL                         ENTRANCE REGISTER
05504  12 4121  1023          ENTAL*TIKTOK      SET INPUT TIMER TO 2.4 SEC
05505  71 2316  1024          ADDALK*2316
05506  44 4154  1025          STRAL*INCLOK
05507  12 4262  1026          ENTAL*FINTJ       PUT RJP*FINT IN EXTERNAL INTER-
05510  44 0000  1027  XM3     STRAL                         RUPT ENTRANCE REGISTER
05511  34 5512  1030          JP*EXEC
05512  57 4131  1031  EXEC    ISK*FINTF         IS FINTF   0
05513  34 5515  1032          JP*LOK+2          NO
05514  34 5520  1033          JP*LOK+4          YES
05515  57 4132  1034          ISK*MINTF         IS MINTF   0
05516  76 5655  1035          RJP*MINTP         NO, DO MINT PROCESSOR SUBROUTINE
05517  76 5573  1036          RJP*FINTP         DO FINT PROCESSOR SUBROUTINE
05520  76 6157  1037          RJP*WATCH         DO WATCHDOG SUBROUTINE
05521  57 4134  1040          ISK*CHANGE        SKIP IF CHANGE   0
05522  34 5526  1041          JP*LOK+4
05523  57 4132  1042          ISK*MINTF         IS MINTF   0
05524  76 5655  1043          RJP*MINTP         NO, DO MINT PROCESSOR SUBROUTINE
05525  34 5512  1044          JP*EXEC
05526  50 3400  1045          SIL
05527  34 6410  1046          JP*SEARCH         LOOK FOR NEW INPUT
05530  00 0000  1047  CLOCK   0                 CLOCK SUBROUTINE
05531  50 3000  1050          RIL
05532  57 4127  1051          ISK*CELLC         IS IT TIME TO INCREMENT TIKTOK
05533  34 5544  1052          JP*J1             NO
05534  75 5556  1053          STRSR*JSRSAV      SAVE REGISTERS
05535  44 4130  1054          STRAL*ALSAV1
05536  12 4121  1055          ENTAL*TIKTOK      INCREMENT TIKTOK
05537  71 0001  1056          ADDALK*1
05540  44 4121  1057          STRAL*TIKTOK
```

```
05620  61 5625  1137          JPALZ*LOK+5          NO
05621  12 4156  1140          ENTAL*PLAYB          IS PLAYBACK FLAG SET
05622  63 5625  1141          JPALNZ*LOK+3         YES
05623  12 0000  1142  XA1     ENTAL                BRING IN REAL ID
05624  34 5626  1143          JP*LOK+2
05625  12 0000  1144          ENTAL                BRING IN DUMP ID
05626  44 1103  1145          STRAL*LBUF+4         PUT ID IN OUTPUT BUFFER
05627  70 0001  1146  A2      ENTALK*1             SET IGNOR FLAG
05630  44 4142  1147          STRAL*IGNORF
05631  34 5641  1150          JP*A3
05632  57 4142  1151  A1      ISK*IGNORF           IS IGNORF EQUAL TO ZERO
05633  34 5635  1152          JP*LOK+2             NO
05634  34 5641  1153          JP*A3                YES
05635  57 4157  1154          ISK*STARTF           IS START FLAG   0
05636  00 0000  1155  XA2     0                    NO. BEGIN OUTPUTTING (RJP TO APPROPRIATE
05637  70 0001  1156          ENTALK*1             SET VALIDF
05640  44 4144  1157          STRAL*VALIDF
05641  70 0001  1160  A3      ENTALK*1             SET BUFLAG AND BUFNOW
05642  44 4145  1161          STRAL*BUFNOW
05643  12 4146  1162          ENTAL*BUFNUM
05644  44 4147  1163          STRAL*BUFLAG
05645  50 7201  1164          ENTICR*1             CLEAR B-BOX 1
05646  36 0000  1165          ENTBK*0
05647  50 7202  1166          ENTICR*2
05650  40 4135  1167          CL*COUNT             SET COUNT EQUAL TO ZERO
05651  40 4121  1170          CL*TIKTOK            RESET TIKTOK TO ZERO
05652  70 0010  1171          ENTALK*10            RESET INPUT TIMER TO 13.7 MS
05653  44 4154  1172          STRAL*INCLOK
05654  55 5573  1173          IJP*FINTP
05655  00 0000  1174  MINTP   0                    INPUT MONITOR INTERRUPT PROCESSOR
05656  12 4135  1175          ENTAL*COUNT          INCREMENT COUNT AND XCOUNT
05657  71 0001  1176          ADDALK*1
05660  44 4135  1177          STRAL*COUNT
05661  44 4136  1200          STRAL*XCOUNT
05662  02 4137  1201          CMAL*NUMBER          COUNT GREATER THAN NUMBER
05663  67 5675  1202          JPMGR*B6             NO
05664  61 5675  1203          JPEQ*B6              NO
05665  40 4144  1204          CL*VALIDF            CLEAR VALID BUFFER FLAG
05666  40 4277  1205          CL*VALID8            CLEAR VALIDATE BUFFER FLAG
05667  12 4225  1206          ENTAL*STATIC         SET BAD BUFFER FLAG
05670  44 1104  1207          STRAL*LBUF+5
05671  70 0001  1210          ENTALK*1             SET IGNOR1 FLAG
05672  44 4140  1211          STRAL*IGNOR1
05673  44 4110  1212          STRAL*FILMAP         PUT PATTERN IN MAP LOCATIONS
05674  30 4143  1213          IRJP*GOLIST
05675  57 4145  1214  B6      ISK*BUFNOW           IS BUFNOW   0
05676  34 5705  1215          JP*XB3               NO
```

```
05677  70 0001  1216          ENTALK+1                SET BUFNOW
05700  44 4145  1217          STRAL*BUFNOW
05701  12 4146  1220          ENTAL*BUFNUM            SET BUFLAG
05702  44 4147  1221          STRAL*BUFLAG
05703  12 0000  1222  XR2     ENTAL                   BRING IN BUFFER 2 FIRST ADDRESS
05704  34 5706  1223          JP*LOK+2
05705  12 0000  1224  XR3     ENTAL                   BRING IN BUFFER 1 FIRST ADDRESS
05706  74 5713  1225          STRADR*R9
05707  50 7202  1226          ENTICR*2
05710  32 4150  1227          ENTR*LENGTH             SET B   BUFFER LENGTH MINUS ONE
05711  12 4151  1230          ENTAL*CNTROL            BRING IN DESIRED CONTROL BIT(S)
05712  44 4152  1231          STRAL*SAVE
05713  13 0000  1232  R9      ENTALR                  BRING IN BUFFER WORDS
05714  52 4152  1233          SLCL*SAVE
05715  73 5712  1234          JP*LOK-3                IF ALL BUFFER WORDS ARE NOT TESTED
05716  02 4151  1235          CMAL*CNTROL             ARE THE CONTROL BITS O.K.
05717  61 5737  1236          JPEQ*R10                YES
05720  40 4144  1237          CL*VALIDF               CLEAR VALID BUFFER FLAG
05721  40 4277  1240          CL*VALIDB               CLEAR VALIDATE BUFFER FLAG
05722  12 4225  1241          ENTAL*STATIC            SET BAD BUFFER FLAG
05723  44 1104  1242          STRAL*LEDF+5
05724  70 0001  1243          ENTALK+1                SET CHANGE AND IGNOR1 FLAGS
05725  44 4134  1244          STRAL*CHANGE
05726  44 4313  1245          STRAL*CHNGE1
05727  44 4140  1246          STRAL*IGNOR1
05730  44 4110  1247          STRAL*FILMAP            PUT PATTERN IN MAP LOCATIONS
05731  30 4143  1250          IRJP*GOLIST
05732  34 5740  1251          JP*B1
05733  12 4140  1252  B10     ENTAL*IGNOR1            IS IGNOR1 FLAG SET
05734  63 5740  1253          JPALNZ*B1               YES
05735  12 4141  1254          ENTAL*IGNOR2            IS IGNOR2 FLAG SET
05736  63 5740  1255          JPALNZ*B1               YES
05737  30 4143  1256          IRJP*GOLIST             UNLOAD BUFFER
05740  55 5555  1257  B1      IJP*MINTR
05741  00 0000  1260  MINTGR  0                       INPUT MONITOR INTERRUPT SUBROUTINE
05742  72 6000  1261          STRICR*RICRSV                 GEMINI REAL-TIME
05743  50 7201  1262          ENTICR*1                ACTIVATE B-BOX 1
05744  67 4147  1263          ISK*BUFLAG              IS BUFLAG   0
05745  34 5760  1264          JP*R4                   NO. SET UP BUFFER 1
05746  36 5747  1265          JPR*LOK+1
05747  34 5754  1266          JP*XB5                  B   0
05750  50 1100  1267  XB1     IN                      INITIATE INPUT BUFFER 1A
05751  20 0310  1270          200310
05752  20 0300  1271          200300
05753  34 5765  1272          JP*R2
05754  50 1100  1273  XB5     IN                      INITIATE INPUT BUFFER 2B
05755  20 0421  1274          200421
```

```
05756  20 0411  1275          200411
05757  34 6005  1276          JP*B3
05760  35 5761  1277  B4      JPB*LOK+1
05761  34 6002  1300          JP*XB4
05762  50 1100  1301  XB6     IN          B   B
05763  20 0410  1302          200410      INITIATE INPUT BUFFER 2A
05764  20 0400  1303          200400
05765  50 3000  1304  B2      RIL
05766  75 5777  1305          STR8R*BSRSAV    SAVE REGISTERS
05767  44 4310  1306          STRAL*ALSAV3
05770  36 0000  1307          ENTBK*0
05771  70 0001  1310          ENTALK*1        CLEAR B-BOX 1
05772  44 4132  1311          STRAL*MINTF     SET MINT FLAG
05773  12 4121  1312  B5      ENTAL*TIKTOK    RESET INPUT TIMER TO 13.7 MS
05774  71 0010  1313          ADDALK*10
05775  44 4154  1314          STRAL*INCLOK
05776  12 4310  1315          ENTAL*ALSAV3    RESTORE REGISTERS
05777  50 7300  1316  BSRSAV  ENTSR
06000  50 7200  1317  BICRSV  ENTICR
06001  55 5741  1320          IJP*MINTGR
06002  50 1100  1321  XB4     IN          INITIATE INPUT BUFFER 1B
06003  20 0321  1322          200321
06004  20 0311  1323          200311
06005  50 3000  1324  B3      RIL
06006  37 0001  1325          ENTBKB*1        INCREMENT B-BOX 1
06007  75 5777  1326          STR8R*BSRSAV    SAVE REGISTERS
06010  44 4310  1327          STRAL*ALSAV3
06011  34 5773  1330          JP*B5
06012  00 0000  1331  MINTGD  0           INPUT MONITOR INTERRUPT SUBROUTINE.
06013  72 6115  1332          STRICR*DICRSV       GEMINI DUMP
06014  50 7201  1333          ENTICR*1        ACTIVATE B-BOX 1
06015  57 4147  1334          ISK*BUFLAG      IS BUFLAG   0
06016  34 6067  1335          JP*D1           NO. SET UP BUFFER 1
06017  35 6020  1336          JPB*LOK+1
06020  34 6033  1337          JP*XD1          B   0
06021  34 6037  1340          JP*XD2          B   1
06022  34 6043  1341          JP*XD3          B   2
06023  34 6047  1342          JP*XD4          B   3
06024  34 6053  1343          JP*XD5          B   4
06025  34 6057  1344          JP*XD6          B   5
06026  34 6063  1345          JP*XD7          B   6
06027  50 1100  1346  XD10    IN          INITIATE INPUT BUFFER 1A
06030  20 0304  1347          200304
06031  20 0300  1350          200300
06032  34 6102  1351          JP*D2
06033  50 1100  1352  XD1     IN          INITIATE INPUT BUFFER 2B
06034  20 0414  1353          200414
```

```
06035  20 0405  1354          200405
06036  34 6152  1355          JP*D3
06037  50 1100  1356    XD2   IN
06040  20 0424  1357          200424
06041  20 0415  1360          200415
06042  34 6152  1361          JP*D3
06043  50 1100  1362    XD3   IN
06044  20 0434  1363          200434
06045  20 0425  1364          200425
06046  34 6152  1365          JP*D3
06047  50 1100  1366    XD4   IN
06050  20 0444  1367          200444
06051  20 0435  1370          200435
06052  34 6152  1371          JP*D3
06053  50 1100  1372    XD5   IN
06054  20 0454  1373          200454
06055  20 0445  1374          200445
06056  34 6152  1375          JP*D3
06057  50 1100  1376    XD6   IN
06060  20 0464  1377          200464
06061  20 0455  1400          200455
06062  34 6152  1401          JP*D3
06063  50 1100  1402    XD7   IN
06064  20 0474  1403          200474
06065  20 0465  1404          200465
06066  34 6152  1405          JP*D3
06067  35 6070  1406    D1    JPR*LOK+1
06070  34 6117  1407          JP*XD11
06071  34 6123  1410          JP*XD12
06072  34 6127  1411          JP*XD13
06073  34 6133  1412          JP*XD14
06074  34 6137  1413          JP*XD15
06075  34 6143  1414          JP*XD16
06076  34 6147  1415          JP*XD17
06077  50 1100  1416    XD20  IN
06100  20 0404  1417          200404
06101  20 0400  1420          200400
06102  50 3000  1421    D2    RIL
06103  75 6114  1422          STRSR*DSRSAV
06104  44 4310  1423          STRAL*ALSAV3
06105  36 0000  1424          ENTBK*0
06106  70 0001  1425          ENTALK*1
06107  44 4132  1426          STRAL*MINTF
06110  12 4121  1427    D4    ENTAL*TIKTOK
06111  71 0010  1430          ADDALK*10
06112  44 4154  1431          STRAL*INCLOK
06113  12 4310  1432          ENTAL*ALSAV3
```

INITIATE INPUT BUFFER 2C

INITIATE INPUT BUFFER 2D

INITIATE INPUT BUFFER 2E

INITIATE INPUT BUFFER 2F

INITIATE INPUT BUFFER 2G

INITIATE INPUT BUFFER 2H

```
B   0
B   1
B   2
B   3
B   4
B   5
B   6
```

INITIATE INPUT BUFFER 2A

SAVE REGISTERS

CLEAR B-BOX 1
SET MINT-FLAG

RESET INPUT TIMER TO 13.7 MS

RESTORE REGISTERS

```
06114  50 7300  1433    DSRSAV  ENTSR*0
06115  50 7200  1434    DICRSV  ENTICR*0
06116  55 6012  1435            IJP*MINTGD
06117  50 1100  1436    XD11    IN                  INITIATE INPUT BUFFER 1B
06120  20 0314  1437            200314
06121  20 0305  1440            200305
06122  34 6152  1441            JP*D3
06123  50 1100  1442    XD12    IN                  INITIATE INPUT BUFFER 1C
06124  20 0324  1443            200324
06125  20 0315  1444            200315
06126  34 6152  1445            JP*D3
06127  50 1100  1446    XD13    IN                  INITIATE INPUT BUFFER 1D
06130  20 0334  1447            200334
06131  20 0325  1450            200325
06132  34 6152  1451            JP*D3
06133  50 1100  1452    XD14    IN                  INITIATE INPUT BUFFER 1E
06134  20 0344  1453            200344
06135  20 0335  1454            200335
06136  34 6152  1455            JP*D3
06137  50 1100  1456    XD15    IN                  INITIATE INPUT BUFFER 1F
06140  20 0354  1457            200354
06141  20 0345  1460            200345
06142  34 6152  1461            JP*D3
06143  50 1100  1462    XD16    IN                  INITIATE INPUT BUFFER 1G
06144  20 0364  1463            200364
06145  20 0355  1464            200355
06146  34 6152  1465            JP*D3
06147  50 1100  1466    XD17    IN                  INITIATE INPUT BUFFER 1H
06150  20 0374  1467            200374
06151  20 0365  1470            200365
06152  50 3000  1471    D3      RIL
06153  37 0001  1472            ENTBKB*1            INCREMENT B-BOX 1
06154  75 6114  1473            STRSR*DSRSAV        SAVE REGISTERS
06155  44 4310  1474            STRAL*ALSAV3
06156  34 6110  1475            JP*D4
06157  00 0000  1476    WATCH   0                   WATCHDOG SUBROUTINE
06160  50 5001  1477            SKP*1               IS SKIP KEY 0 SET (LOS)
06161  34 6173  1500            JP*L11              NO
06162  40 4144  1501            CL*VALIDF           CLEAR VALID BUFFER FLAG
06163  40 4277  1502            CL*VALIDB           CLEAR VALIDATE BUFFER FLAG
06164  12 4225  1503            ENTAL*STATIC
06165  44 1104  1504            STRAL*LBUF+5
06166  70 0001  1505            ENTALK*1
06167  44 4160  1506            STRAL*LOSF
06170  44 4140  1507            STRAL*IGNOR1
06171  44 4110  1510            STRAL*FILMAP
06172  30 4143  1511            IRJP*GOLIST
```

```
06173  50 0004  1512   L11     SKP*4
06174  34 6225  1513           JP*L2
06175  12 4171  1514           ENTAL*GEMINI
06176  61 6203  1515           JPALZ*LOK+5
06177  40 4171  1516           CL*GEMINI
06200  70 0001  1517           ENTALK*1
06201  44 4134  1520           STRAL*CHANGE
06202  44 4313  1521           STRAL*CHNGE1
06203  50 5010  1522           SKP*10
06204  34 6215  1523           JP*LOK+11
06205  12 4155  1524           ENTAL*REAL
06206  61 6213  1525           JPALZ*LOK+5
06207  40 4155  1526           CL*REAL
06210  70 0001  1527           ENTALK*1
06211  44 4134  1530           STRAL*CHANGE
06212  44 4313  1531           STRAL*CHNGE1
06213  10 4244  1532           ENTAU*ARBIT
06214  34 6254  1533           JP*L1
06215  12 4155  1534           ENTAL*REAL
06216  63 6223  1535           JPALNZ*LOK+5
06217  70 0001  1536           ENTALK*1
06220  44 4155  1537           STRAL*REAL
06221  44 4134  1540           STRAL*CHANGE
06222  44 4313  1541           STRAL*CHNGE1
06223  10 4245  1542           ENTAU*ARBIT
06224  34 6254  1543           JP*L1
06225  12 4171  1544   L2      ENTAL*GEMINI
06226  63 6233  1545           JPALNZ*LOK+5
06227  70 0001  1546           ENTALK*1
06230  44 4171  1547           STRAL*GEMINI
06231  44 4134  1550           STRAL*CHANGE
06232  44 4313  1551           STRAL*CHNGE1
06233  50 5010  1552           SKP*10
06234  34 6245  1553           JP*LOK+11
06235  12 4155  1554           ENTAL*REAL
06236  61 6243  1555           JPALZ*LOK+5
06237  40 4155  1556           CL*REAL
06240  70 0001  1557           ENTALK*1
06241  44 4134  1560           STRAL*CHANGE
06242  44 4313  1561           STRAL*CHNGE1
06243  10 4246  1562           ENTAU*GDRIT
06244  34 6254  1563           JP*L1
06245  12 4155  1564           ENTAL*REAL
06246  63 6253  1565           JPALNZ*LOK+5
06247  70 0001  1566           ENTALK*1
06250  44 4155  1567           STRAL*REAL
06251  44 4134  1570           STRAL*CHANGE
```

```
SKIP IF KEY 2 SET (AGENA)
NO
IS GEMINI FLAG SET
NO
CLEAR GEMINI FLAG
SET CHANGE FLAG


IS SKIP KEY 3 SET (DUMP)
NO
IS REAL FLAG SET
NO
CLEAR REAL FLAG
SET CHANGE FLAG


SET BIT 17 (AGENA DUMP) OF CNTROL

IS REAL FLAG SET
YES
SET REAL FLAG

SET CHANGE FLAG

SET BIT 16 (AGENA REAL) OF CNTROL

IS GEMINI FLAG SET
YES
SET GEMINI FLAG

SET CHANGE FLAG

IS SKIP KEY 3 SET (DUMP)
NO
IS REAL FLAG SET
NO
CLEAR REAL FLAG
SET CHANGE FLAG


SET BIT 15 (GEMINI DUMP) OF CNTROL

IS REAL FLAG SET
YES
SET REAL FLAG

SET CHANGE FLAG
```

```
06252  44 4313  1571          STRAL*CHNGE1
06253  10 4247  1572          ENTAU*GRBIT      SET BIT 14 (GEMINI REAL) OF CNTROL
06254  57 4313  1573    L1    ISK*CHNGE1       WERE THE SKIP KEYS CHANGED
06255  34 6257  1574          JP*LOK+2         YES
06256  34 6274  1575          JP*L6            NO
06257  46 4151  1576          STRAU*CNTROL     SET PROPER CONTROL BIT
06260  40 4144  1577          CL*VALIDF        ALERT PROGRAM TO CHANGE
06261  40 4277  1600          CL*VALID8
06262  12 4225  1601          ENTAL*STATIC
06263  44 1104  1602          STRAL*LBUF+5
06264  70 0001  1603          ENTALK*1
06265  44 4140  1604          STRAL*IGNOR1
06266  34 0000  1605          JP               SKIP NEXT TWO INSTRUCTIONS DURING
06267  44 4110  1606    L7    STRAL*FILMAP                INITIALIZATION
06270  30 4143  1607          IRJP*GOLIST
06271  70 0003  1610    L12   ENTALK*3         SET NODATA COUNTERS
06272  44 4202  1611          STRAL*NODATF
06273  44 4302  1612          STRAL*NODATG
06274  12 4121  1613    L6    ENTAL*TIKTOK     IS TIME UP UNTIL NEXT MINT
06275  02 4154  1614          CMAL*INCLOK
06276  65 6300  1615          JPMLEQ*LOK+2     YES
06277  34 6344  1616          JP*L10           NO
06300  40 4144  1617          CL*VALIDF        CLEAR VALID BUFFER FLAG
06301  40 4277  1620          CL*VALID8        CLEAR VALIDATE BUFFER FLAG
06302  12 4225  1621          ENTAL*STATIC     SET STATIC FLAG
06303  44 1104  1622          STRAL*LBUF+5
06304  70 0001  1623          ENTALK*1         SET IGNOR1 FLAG
06305  44 4140  1624          STRAL*IGNOR1
06306  44 4110  1625          STRAL*FILMAP
06307  30 4143  1626          IRJP*GOLIST
06310  50 1100  1627    XL1   IN               SET UP 1-WORD BUFFER ON ALTERNATE CHANNEL
06311  00 4174  1630          0*XBUF
06312  00 4174  1631          0*XBUF
06313  12 4121  1632          ENTAL*TIKTOK     SET 1.95 MS TIME LIMIT ON CHECK-
06314  71 0002  1633          ADDALK*2                    ING ALTERNATE CHANNEL
06315  44 4312  1634          STRAL*CLOCK1
06316  50 2100  1635    XL2   SKPIIN
06317  34 6321  1636          JP*LOK+2         INPUT IS STILL ACTIVE
06320  34 6326  1637          JP*LOK+6         WORD HAS COME IN
06321  12 4312  1640          ENTAL*CLOCK1     IS TIME LIMIT UP
06322  02 4121  1641          CMAL*TIKTOK
06323  65 6316  1642          JPMLEQ*XL2       NO
06324  50 1500  1643    XL4   INSTP            YES
06325  34 6341  1644          JP*L5
06326  12 4174  1645          ENTAL*XBUF       BRING INPUT WORD IN
06327  52 4151  1646          SLCL*CNTROL      ARE CONTROL BITS O.K.
06330  02 4151  1647          CMAL*CNTROL
```

```
06331  00 6341  1650          JPNOT*L5
06332  12 4200  1651          ENTAL*CHANNL
06333  10 4201  1652          ENTAU*NCHANL
06334  44 4201  1653          STRAL*NCHANL
06335  46 4200  1654          STRAU*CHANNL
06336  70 0001  1655          ENTALK*1
06337  44 4303  1656          STRAL*SWITCH
06340  34 5202  1657          JP*BEGIN2
06341  12 4121  1660  L5      ENTAL*TIKTOK
06342  71 0010  1661          ADDALK*10
06343  44 4154  1662          STRAL*INCLOK
06344  12 4170  1663  L10     ENTAL*TIMER
06345  02 4120  1664          CMAL*BIGBEN
06346  63 6364  1665          JPNOT*L3
06347  40 4144  1666          CL*VALIDF
06350  40 4277  1667          CL*VALIDB
06351  12 4225  1670          ENTAL*STATIC
06352  44 1104  1671          STRAL*LBUF+5
06353  70 0001  1672          ENTALK*1
06354  44 4140  1673          STRAL*IGNOR1
06355  12 4304  1674          ENTAL*YDTUON
06356  74 0000  1675  XL3     STRADR*0
06357  50 2700  1676          EXFOV
06360  12 4120  1677          ENTAL*BIGBEN
06361  71 0022  1700          ADDALK*22
06362  44 4170  1701          STRAL*TIMER
06363  50 2700  1702  XL5     EXFOV
06364  50 6020  1703  L3      SKP*20
06365  34 6373  1704          JP*LOK+6
06366  12 4156  1705          ENTAL*PLAYB
06367  63 6407  1706          JPALNZ*L4
06370  70 0001  1707          ENTALK*1
06371  44 4155  1710          STRAL*PLAYR
06372  34 6376  1711          JP*L9
06373  12 4156  1712          ENTAL*PLAYB
06374  61 6407  1713          JPALZ*L4
06375  40 4156  1714          CL*PLAYR
06376  40 4144  1715  L9      CL*VALIDF
06377  40 4277  1716          CL*VALIDB
06400  12 4225  1717          ENTAL*STATIC
06401  44 1104  1720          STRAL*LBUF+5
06402  70 0001  1721          ENTALK*1
06403  44 4141  1722          STRAL*IGNOR2
06404  34 0000  1723          JP
06405  44 4117  1724  L8      STRAL*FILMAP
06406  30 4143  1725          IRJP*GOLIST
06407  56 6167  1726  L4      IJP*WATCH
```

NO
CHANGE CHANNELS

RE-INITIALIZE INPUT CHANNEL NUMBER

RESET INPUT TIMER

IS TIME LIMIT UP TO NEXT MOUT

NO
CLEAR VALID BUFFER FLAG
CLEAR VALIDATE BUFFER FLAG
SET BAD BUFFER FLAG

SET IGNOR1 FLAG

PUT ADDRESS OF DTU CONTROL
WORDS IN EF BUFFER CONTROL
REGISTER, AND FORCE THEM OUT
RESET OUTPUT TIMER

IS SKIP KEY 4 (PLAYBACK) SET
NO, DATA IS LIVE
IS PLAYBACK FLAG SET
YES
SET PLAYB FLAG

IS PLAYB FLAG SET
NO
CLEAR PLAYB FLAG
CLEAR VALID BUFFER FLAG
CLEAR VALIDATE BUFFER FLAG
SET BAD BUFFER FLAG

SET IGNOR2 FLAG

SKIP NEXT 2 INSTRUCTIONS DURING
INITIALIZATION

EXIT WATCHDOG

```
06410  50 1500  1727   SEARCH  INSTP                  TERMINATE INPUT ON CHANNELS IN USE
06411  50 1500  1730           INSTP
06412  12 4251  1731           ENTAL*PUTRIL           PUT RIL* IN EXTERNAL INTERRUPT
06413  44 0000  1732   XE1     STRAL                                ENTRANCE REGISTERS
06414  44 0000  1733           STRAL
06415  12 6517  1734           ENTAL*XPATCH           PUT RJP*XCHECK AND RJP*YCHECK IN
06416  44 0000  1735           STRAL                        INPUT MONITOR INTERRUPT REGISTERS
06417  12 6520  1736           ENTAL*YPATCH
06420  44 0000  1737           STRAL
06421  40 4172  1740           CL*XFLAG               CLEAR FLAGS IN XCHECK AND YCHECK
06422  40 4173  1741           CL*YFLAG
06423  50 1100  1742   XE2     IN                     SET UP 1-WORD BUFFERS ON INPUT CHANNELS
06424  20 4174  1743           20*XBUF
06425  20 4174  1744           20*XBUF
06426  50 1100  1745           IN
06427  20 4175  1746           20*YBUF
06430  20 4175  1747           20*YBUF
06431  50 3000  1750           RIL
06432  12 4151  1751           ENTAL*CNTROL           CLEAR CNTROL EXCEPT FOR
06433  52 4311  1752           SLCL*MASK3                           KIND OF DATA
06434  44 4151  1753           STRAL*CNTROL
06435  12 4121  1754           ENTAL*TIKTOK           SET 1.95 MS TIME LIMIT ON
06436  71 0002  1755           ADDALK*2                             FINDING INPUT
06437  44 4154  1756           STRAL*INCLOK
06440  50 2400  1757           WTFI                   WAIT FOR INPUT MONITOR OR CLOCK INTERRUPT
06441  12 4154  1760           ENTAL*INCLOK           IS TIME LIMIT UP
06442  02 4121  1761           CMAL*TIKTOK
06443  63 6440  1762           JPNOT*LOK-3            NO
06444  50 3400  1763           SIL
06445  12 4251  1764           ENTAL*PUTRIL           PUT RIL* IN INPUT MONITOR INTER-
06446  44 0000  1765   XE3     STRAL                                RUPT ENTRANCE REGISTERS
06447  44 0000  1766           STRAL
06450  50 3000  1767           RIL
06451  12 4172  1770           ENTAL*XFLAG            WAS CORRECT DATA IN CHANNEL X
06452  61 6460  1771           JPALZ*E7+3             NO
06453  12 4173  1772           ENTAL*YFLAG            WAS CORRECT DATA IN CHANNEL Y
06454  63 6467  1773           JPALNZ*E8              YES
06455  12 4176  1774   E7      ENTAL*CHANLX           PUT CHANLX IN CHANNL
06456  10 4177  1775           ENTAU*CHANLY           PUT CHANLY IN NCHANL
06457  34 6464  1776           JP*LOK+5
06460  12 4173  1777           ENTAL*YFLAG            WAS CORRECT DATA IN CHANNEL Y
06461  51 6521  2000           JPALZ*NODATA           NO
06462  12 4177  2001           ENTAL*CHANLY           PUT CHANLY IN CHANNL
06463  10 4176  2002           ENTAU*CHANLX           PUT CHANLX IN NCHANL
06464  44 4200  2003           STRAL*CHANNL
06465  40 4201  2004           STRAU*NCHANL
06466  34 5202  2005           JP*BEGIN2
```

```
06467  12 4151  2006  F6      ENTAL*CNTROL
06470  51 4250  2007          SLSET*BIT13
06471  12 4174  2010          ENTAL*XBUF
06472  52 4250  2011          SLCL*BIT13
06473  53 6455  2012          JPALNZ*E7
06474  34 6462  2013          JP*E7+5
06475  00 0000  2014  XCHECK  0
06476  44 4162  2015          STRAL*ALSAV4
06477  12 4174  2016          ENTAL*XBUF
06500  52 4151  2017          SLCL*CNTROL
06501  61 6504  2020          JPALZ*LOK+3
06502  70 0001  2021          ENTALK*1
06503  44 4172  2022          STRAL*XFLAG
06504  12 4162  2023          ENTAL*ALSAV4
06505  54 6475  2024          IJPEI*XCHECK
06506  00 0000  2025  YCHECK  0
06507  44 4162  2026          STRAL*ALSAV4
06510  12 4175  2027          ENTAL*YBUF
06511  52 4151  2030          SLCL*CNTROL
06512  61 6515  2031          JPALZ*LOK+3
06513  70 0001  2032          ENTALK*1
06514  44 4173  2033          STRAL*YFLAG
06515  12 4162  2034          ENTAL*ALSAV4
06516  54 6506  2035          IJPEI*YCHECK
06517  76 6475  2036  XPATCH  RJP*XCHECK
06520  76 6506  2037  YPATCH  RJP*YCHECK
06521  57 4202  2040  NODATA  ISK*NODATF
06522  34 6524  2041          JP*F1
06523  34 6535  2042          JP*F2
06524  12 4120  2043  F1      ENTAL*BIGBEN
06525  71 0020  2044          ADDALK*20
06526  44 4312  2045          STRAL*CLOCK1
06527  12 4120  2046          ENTAL*BIGBEN
06530  02 4312  2047          CMAL*CLOCK1
06531  63 6527  2050          JPNOT*LOK-2
06532  40 4121  2051          CL*TIKTOK
06533  76 6157  2052          RJP*WATCH
06534  34 6410  2053          JP*SEARCH
06535  12 4302  2054  F2      ENTAL*NODATG
06536  71 0003  2055          ADDALK*3
06537  44 4202  2056          STRAL*NODATF
06540  44 4302  2057          STRAL*NODATG
06541  50 1300  2060          EXF*0
06542  00 4243  2061          0*XJNPR+1
06543  00 4242  2062          0*XONPR
06544  12 6617  2063  YF3     ENTAL*MESS1
06545  76 6574  2064          RJP*SEND
```

SET BIT 13 OF CNTROL

BRING IN WORD FROM CHANNEL X
IS BIT 13 SET
YES
NO
INPUT MONITOR INTERRUPT SUBROUTINE FOR

BRING IN WORD CHANNEL X
DOES IT HAVE THE DESIRED CONTROL
NO BITS
SET XFLAG

INPUT MONITOR INTERRUPT SUBROUTINE FOR

BRING IN WORD CHANNEL Y
DOES IT HAVE THE DESIRED CONTROL
NO BITS
SET YFLAG

IS NODATF ZERO
NO
YES
SET WAITING PERIOD TO 2 SECONDS

IS WAITING PERIOD OVER

NO

PRESET NODATF FOR NEXT LOOP

TURN ON PRINTER

SEND MESSAGE 1

```
06546   12 4171  2065          ENTAL*GEMINI          IS GEMINI FLAG SET
06547   61 6552  2066          JPALZ*LOK+3           NO
06550   12 6643  2067          ENTAL*MESSG           SEND GEMINI MESSAGE
06551   34 6553  2070          JP*LOK+2
06552   12 6655  2071          ENTAL*MESSA           SEND AGENA MESSAGE
06553   76 6574  2072          RJP*SEND
06554   12 4155  2073          ENTAL*REAL            IS REAL FLAG SET
06555   51 6560  2074          JPALZ*LOK+3           NO
06556   12 6666  2075          ENTAL*MESSR           SEND REAL-TIME MESSAGE
06557   34 6561  2076          JP*LOK+2
06560   12 6703  2077          ENTAL*MESSD           SEND DUMP MESSAGE
06561   76 6574  2100          RJP*SEND
06562   12 6713  2101  YF1     ENTAL*MESS2           SEND MESSAGE 2
06563   76 6574  2102          RJP*SEND
06564   50 1300  2103          EXF*0                 TURN OFF PRINTER
06565   00 4244  2104          0*XOFFPR+1
06566   00 4243  2105          0*XOFFPR
06567   50 2300  2106          SKPFIN*0
06570   34 6567  2107          JP*LOK-1
06571   40 4121  2110  YF2     CL*TIKTOK             DISABLE INPUT TIMER
06572   76 6157  2111          RJP*WATCH
06573   34 6410  2112          JP*SEARCH
06574   00 0000  2113  SEND    0                     SEND MESSAGE SUBROUTINE
06575   74 6600  2114          STRADR*LOK+3          LOAD ADDRESSES OF BUFFER CONTROL
06576   71 0001  2115          ADDALK*1                                    WORDS
06577   74 6602  2116          STRADR*LOK+3
06600   12 0000  2117          ENTAL                 LOAD BUFFER CONTROL WORDS
06601   44 6607  2120          STRAL*LOK+6
06602   12 0000  2121          ENTAL
06603   44 6610  2122          STRAL*LOK+5
06604   12 6616  2123          ENTAL*SENDJ           LOAD OUTPUT MONITOR INTERRUPT
06605   44 0140  2124          STRAL*140                       ENTRANCE REGISTER
06606   50 1200  2125          OUT*0                 SEND OUT MESSAGE
06607   00 0000  2126          0
06610   00 0000  2127          0
06611   40 4133  2130          CL*SENDF
06612   50 2400  2131          WTFI
06613   57 4133  2132          ISK*SENDF
06614   55 6574  2133          IJP*SEND
06615   34 6620  2134          JP*LOK+3
06616   76 6760  2135  SENDJ   RJP*SEND1
06617   00 6620  2136  MESS1   0*LOK+1
06620   20 6643  2137          20*MESS1+24
06621   20 6622  2140          20*MESS1+3
06622   00 0004  2141          4                     CARRIAGE RETURN
06623   00 0003  2142          3                     LINE FEED
06624   00 0003  2143          3                     LINE FEED
```

```
06625  00 0015  2144                15                I
06626  00 0005  2145                5                 SPACE
06627  00 0010  2146                10                C
06630  00 0006  2147                6                 A
06631  00 0023  2150                23                N
06632  00 0005  2151                5                 SPACE
06633  00 0013  2152                13                F
06634  00 0016  2153                16                I
06635  00 0023  2154                23                N
06636  00 0011  2155                11                D
06637  00 0005  2156                5                 SPACE
06640  00 0023  2157                23                N
06641  00 0024  2160                24                O
06642  00 0005  2161                5                 SPACE
06643  00 6644  2162    MESSG       0*LOK+1
06644  20 6655  2163                20*MESSG+12
06645  20 6646  2164                20*MESSG+3
06646  00 0014  2165                14                G
06647  00 0012  2166                12                E
06650  00 0022  2167                22                M
06651  00 0016  2170                16                I
06652  00 0023  2171                23                N
06653  00 0016  2172                16                I
06654  00 0005  2173                5                 SPACE
06655  00 6656  2174    MESSA       0*LOK+1
06656  20 6666  2175                20*MESSA+11
06657  20 6660  2176                20*MESSA+3
06660  00 0006  2177                6                 A
06661  00 0014  2200                14                G
06662  00 0012  2201                12                E
06663  00 0023  2202                23                N
06664  00 0006  2203                6                 A
06665  00 0005  2204                5                 SPACE
06666  00 6667  2205    MESSR       0*LOK+1
06667  20 6703  2206                20*MESSR+15
06670  20 6671  2207                20*MESSR+3
06671  00 0027  2210                27                R
06672  00 0012  2211                12                E
06673  00 0006  2212                6                 A
06674  00 0021  2213                21                L
06675  00 0041  2214                41                -
06676  00 0031  2215                31                T
06677  00 0016  2216                16                I
06700  00 0022  2217                22                M
06701  00 0012  2220                12                E
06702  00 0005  2221                5                 SPACE
06703  00 6704  2222    MESSD       0*LOK+1
```

```
06704  20 6713  2223          20*MESSD+10
06705  20 6706  2224          20*MESS0+3
06706  00 0011  2225          11                    D
06707  00 0032  2226          32                    U
06710  00 0022  2227          22                    M
06711  00 0025  2230          25                    P
06712  00 0005  2231          5                     SPACE
06713  00 6714  2232  MESS2   0*LOK+1
06714  20 6700  2233          20*MESS2+45
06715  20 6716  2234          20*MESS2+3
06716  00 0011  2235          11                    I
06717  00 0006  2236          6                     A
06720  00 0031  2237          31                    T
06721  00 0006  2240          6                     A
06722  00 0005  2241          5                     SPACE
06723  00 0024  2242          24                    O
06724  00 0023  2243          23                    N
06725  00 0005  2244          5                     SPACE
06726  00 0010  2245          10                    C
06727  00 0015  2246          15                    H
06730  00 0006  2247          6                     A
06731  00 0023  2250          23                    N
06732  00 0023  2251          23                    N
06733  00 0012  2252          12                    E
06734  00 0021  2253          21                    L
06735  00 0005  2254          5                     SPACE
06736  00 0000  2255          0                     LOAD,CHANNEL X HERE
06737  00 0005  2256          5                     SPACE
06740  00 0024  2257          24                    O
06741  00 0027  2260          27                    R
06742  00 0005  2261          5                     SPACE
06743  00 0010  2262          10                    C
06744  00 0015  2263          15                    H
06745  00 0006  2264          6                     A
06746  00 0023  2265          23                    N
06747  00 0023  2266          23                    N
06750  00 0012  2267          12                    E
06751  00 0021  2270          21                    L
06752  00 0005  2271          5                     SPACE
06753  00 0000  2272          0                     LOAD CHANNEL Y HERE
06754  00 0075  2273          75                    .
06755  00 0004  2274          4                     CARRIAGE RETURN
06756  00 0003  2275          3                     LINE FEED
06757  00 0003  2276          3                     LINE FEED
06760  00 0000  2277  SEND1   0*3
06761  44 4162  2300          STRAL*ALSAV4
06762  70 0001  2301          ENTALK*1
```

```
06763  44 4133  2302          STRAL*SLSIF
06764  12 4102  2303          ENTAL*ALSAV4
06765  54 6760  2304          IJPEI*SEND1
06766  00 0000  2305  MOUTO    0
06767  50 3000  2306          RIL
06770  75 7040  2307          STRSR*CSRSV1
06771  44 4300  2310          STRAL*ALSAV2
06772  46 4301  2311          STRAU*AUSAV2
06773  12 4120  2312          ENTAL*RIGBEN
06774  71 0022  2313          ADDALK*22
06775  44 4170  2314          STRAL*TIMER
06776  12 4160  2315          ENTAL*LOSF
06777  61 7021  2316          JPALZ*C3
07000  12 4161  2317          ENTAL*LOS1F
07001  61 7006  2320          JPALZ*C4
07002  50 3400  2321          SIL
07003  10 4167  2322          ENTAU*STRAU
07004  12 4166  2323          ENTAL*STRAL
07005  34 4777  2324          JP*PAUSE
07006  10 1103  2325  C4      ENTAU*LBUF+4
07007  50 4301  2326          RSHA*1
07010  50 6100  2327          CPAL
07011  50 4321  2330          RSHA*17B
07012  51 4231  2331          SLSET*B17
07013  44 1103  2332          STRAL*LBUF+4
07014  70 0001  2333          ENTALK*1
07015  44 4161  2334          STRAL*LOS1F
07016  12 2063  2335          ENTAL*2063
07017  51 4232  2336          SLSET*BIT6
07020  44 2063  2337          STRAL*2063
07021  57 4144  2340  C3      ISK*VALIDF
07022  34 7031  2341          JP*LOK+7
07023  57 4277  2342          ISK*VALID8
07024  34 7026  2343          JP*LOK+2
07025  34 7033  2344          JP*XC2
07026  12 4254  2345          ENTAL*DATAOA
07027  44 1104  2346          STRAL*LBUF+5
07030  34 7033  2347          JP*XC2
07031  70 0001  2350          ENTALK*1
07032  44 4277  2351          STRAL*VALID8
07033  50 1200  2352  XC2     OUT
07034  20 2064  2353          202064
07035  20 1100  2354          201100
07036  12 4300  2355          ENTAL*ALSAV2
07037  10 4301  2356          ENTAU*AUSAV2
07040  50 7300  2357  CSRSV1  ENTSR
07041  55 6766  2360          IJP*MOUTO
```

OUTPUT MONITOR INTERRUPT SUBROUTINE.
UNIVERSAL MODEL

SAVE REGISTERS

SET TIME LIMIT TO NEXT MOUT

IS LOS FLAG SET
NO
IS LOS1 FLAG SET
NO

SET UP REGISTERS

STOP
BRING IN ID WORD
CHANGE PARITY BIT

SET BIT 7 (LAST FRAME)

SET LOS1 FLAG

SET BIT 6 OF LAST BUFFER WORD

IS VALID BUFFER FLAG 0
NO
IS VALIDATE BUFFER FLAG 0
NO

VALIDATE BUFFER

SET*VALID8

INITIATE OUTPUT BUFFER

RESTORE REGISTERS

RETURN TO PROGRAM

```
07042  00 0000  2361  MOUTGR  0                  OUTPUT MONITOR INTERRUPT SUBROUTINE,
07043  50 3000  2362         RIL                          GEMINI REAL-TIME MODEL
07044  75 7144  2363         STPSR*CSRSV2       SAVE REGISTERS
07045  44 4300  2364         STRAL*ALSAV2
07046  46 4301  2365         STRAU*AUSAV2
07047  12 4163  2366         ENTAL*WHICH1       WHICH AREA TO OUTPUT NEXT
07050  61 7064  2367         JPALZ*FIRST
07051  02 4122  2370         CMAL*EIMS
07052  61 7131  2371         JPEQ*SECOND
07053  12 4120  2372  THIRD  ENTAL*BIGBEN       SET TIME LIMIT TO NEXT MOUT
07054  71 0007  2373         ADDALK*7
07055  44 4170  2374         STRAL*TIMER
07056  76 7146  2375         RJP*FIXTR          CORRECT TIME-TO-RETROFIRE (TR)
07057  50 1200  2376         OUT                INITIATE THIRD OUTPUT BUFFER
07060  20 2064  2377         202064
07061  20 1576  2400         [illegible]
07062  70 0000  2401         ENTAL[illegible]
07063  34 7141  2402         JP*C2              SET WHICH1   0
07064  12 4120  2403  FIRST  ENTAL*BIGBEN       SET TIME LIMIT TO NEXT MOUT
07065  71 0004  2404         ADDALK*4
07066  44 4170  2405         STRAL*TIMER
07067  12 4160  2406         ENTAL*LOSF         IS LOS FLAG SET
07070  61 7112  2407         JPALZ*C1           NO
07071  12 4161  2410         ENTAL*LOS1F        IS LOS1 FLAG SET
07072  61 7077  2411         JPALZ*C5           NO
07073  50 3400  2412         SIL                SET UP REGISTERS
07074  10 4167  2413         ENTAU*STORAU
07075  12 4166  2414         ENTAL*STORAL       STOP
07076  34 4777  2415         JP*PAUSE           BRING IN ID WORD
07077  10 1103  2416  C5     ENTAU*LBUF+4       CHANGE PARITY BIT
07100  50 4301  2417         RSHA*1
07101  50 6100  2420         CPAL               SET BIT 7 (LAST FRAME)
07102  50 4321  2421         RSHA*17D
07103  51 4231  2422         SLSET*BIT7         SET LOS1 FLAG
07104  44 1103  2423         STRAL*LBUF+4
07105  70 0001  2424         ENT*LK*1           SET BIT 8 OF LAST BUFFER WORD
07106  44 4161  2425         STRAL*LOS1F
07107  12 4063  2426         ENTAL*2063         IS VALID BUFFER FLAG   0
07110  51 4232  2427         SLSET*BIT8         NO
07111  44 2063  2430         STRAL*2063         IS VALIDATE BUFFER FLAG   0
07112  57 4144  2431  C1     ISK*VALIDF         NO
07113  34 7122  2432         JP*LOK+7           VALIDATE BUFFER
07114  57 4277  2433         ISK*VALID8
07115  34 7117  2434         JP*LOK+2
07116  34 7124  2435         JP*XC4
07117  12 4254  2436         ENTAL*DATAOK
07120  44 1104  2437         STRAL*LBUF+5
```

```
07121  34 7124  2440          JP*XC4
07122  70 0001  2441          ENTALK*1
07123  44 4277  2442          STRAL*VALID8
07124  50 1200  2443  XC4     OUT
07125  20 1204  2444          201204
07126  20 1100  2445          201100
07127  70 0001  2446          ENTALK*1
07130  34 7141  2447          JP*C2
07131  12 4120  2450  SECOND  ENTAL*BIGBEN
07132  71 0012  2451          ADDALK*12
07133  44 4170  2452          STRAL*TIMER
07134  76 7146  2453          RJP*FIXTR
07135  50 1200  2454          OUT
07136  20 1576  2455          201576
07137  20 1204  2456          201204
07140  70 0002  2457          ENTALK*2
07141  44 4163  2460  C2      STRAL*WHICH1
07142  12 4300  2461          ENTAL*ALSAV2
07143  10 4301  2462          ENTAU*AUSAV2
07144  60 7300  2463  CSRSV2  ENTSR
07145  55 7042  2464          IJP*MOUTGR
07146  00 0000  2465  FIXTR    0
07147  50 5100  2466          SKPNB0
07150  34 7151  2467          JP*LOK+1
07151  12 4120  2470          ENTAL*BIGBEN
07152  44 4164  2471          STRAL*HOLDIT
07153  16 4117  2472          SUBAL*TIMET
07154  44 4124  2473          STRAL*DELTAT
07155  12 4164  2474          ENTAL*HOLDIT
07156  44 4117  2475          STRAL*TIMET
07157  10 1206  2476          ENTAU*LBUF+71D
07160  50 4310  2477          RSHA*8D
07161  10 1205  2500          ENTAU*LBUF+70D
07162  50 4310  2501          RSHA*8D
07163  10 1204  2502          ENTAU*LBUF+69D
07164  50 4302  2503          RSHA*2
07165  22 4124  2504          SUBA*DELTAT
07166  50 5100  2505          SKPNB0
07167  22 4122  2506          SUBA*EIGHTS
07170  50 4702  2507          LSHA*2
07171  46 4155  2510          STRAU*AUSAVE
07172  10 4233  2511          ENTAU*ZERO
07173  50 4710  2512          LSHA*8D
07174  46 1205  2513          STRAU*LBUF+70D
07175  46 1577  2514          STRAU*LBUF+320D
07176  10 4233  2515          ENTAU*ZERO
07177  50 4710  2515          LSHA*8D
```

```
SET VALID8

INITIATE FIRST OUTPUT BUFFER

SET WHICH1   1

SET TIME LIMIT TO NEXT MOUT

CORRECT IR
INITIATE SECOND OUTPUT BUFFER

SET WHICH1   2

RESTORE REGISTERS

RETURN TO PROGRAM
CORRECT TR SUBROUTINE
CLEAR BORROW DESIGNATOR

PUT PRESENT TIME IN HOLDIT

PUT CORRECTING TIME INIERVAL
                  IN DELTAT
PUT NEW TIME TAG IN TIMET

BRING IN LEAST SIGNIFICANT
            SYLLABLE (LSS) OF TR
BRING IN MIDDLE SIGNIFICANT
            SYLLABLE (MIDSS) OF TR
BRING IN MOST SIGNIFICANT
            SYLLABLE (MSS) OF TR
SUBTRACT CORRECTING TIME
CORRECT IF BORROW     INTERVAL

PUT MSS IN AUSAVE

PUT AWAY MIDSS


PUT AWAY LSS
```

```
07200   46 1206   2517            STRAU*LBUF+71D
07201   46 1600   2520            STRAU*LBUF+321D
07202   12 4105   2521            ENTAL*AUSAVE                    BRING MSS TO AL
07203   52 4234   2522            SLCL*SAFETY                     CLEAR BITS 8-12
07204   44 1204   2523            STRAL*LBUF+69D
07205   44 1576   2524            STRAL*LBUF+319D
07206   55 7146   2525            IJP*FIXTR


MEM. STRG. USED  3063
10000  THRU  13062
                  0       LIST3   PROG*WENTZ*13FEB1965
88
10000   00 0000   1       LISTGR  0*0
10001   50 7207   2               ENTICR*7                        SELECT B BOX 7
10002   50 7310   3               ENTSR*10                        SET SR ACTIVE TO BANK 0
10003   12 4110   4               ENTAL*FILMAP                    PICK UP FLAGS
10004   61 0046   5               JPALZ*LIST2                     IF DATA IS GOOD
10005   40 4110   6               CL*FILMAP
10006   02 4122   7               CMAL*EINS                       IS FILMAP A ONE
10007   63 0012   10              JPNOT*LOK+3                     FILMAP   2
10010   12 4253   11              ENTAL*MUP
10011   34 0317   12              JP*SENDIT+1
10012   12 4111   13              ENTAL*BUFCR
10013   74 0507   14              STRADR*RL4AD
10014   74 0617   15              STRADR*RL8AD
10015   74 1122   16              STRADR*RL16AD
10016   74 1265   17              STRADR*RL20AD
10017   74 1375   20              STRADR*RL24AD
10020   74 1505   21              STRADR*RL28AD
10021   74 1606   22              STRADR*RL32AD
10022   74 1664   23              STRADR*RL36AD
10023   74 1734   24              STRADR*RL40AD
10024   74 2004   25              STRADR*RL44AD
10025   74 2047   26              STRADR*RL48AD
10026   74 2116   27              STRADR*RL52AD
10027   74 2166   30              STRADR*RL56AD
10030   74 2236   31              STRADR*RL60AD
10031   74 2300   32              STRADR*RL64AD
10032   74 2350   33              STRADR*RL68AD
10033   74 2420   34              STRADR*RL72AD
10034   74 2470   35              STRADR*RL76AD
10035   74 2533   36              STRADR*RL80AD
10036   74 2602   37              STRADR*RL84AD
10037   74 2652   40              STRADR*RL88AD
10040   74 2722   41              STRADR*RL92AD
10041   74 2764   42              STRADR*RL96AD
```

```
10042  50 7206  43              ENTICR*6
10043  36 0000  44              ENTBK*0
10044  50 7300  45              ENTSR*0
10045  55 0000  46              IJP*LISTGR
10046  32 4136  47      LIST2   ENTB*XCOUNT          PICK UP FRAME COUNT
10047  50 7311  50              ENTSR*11             SET SR ACTIVE TO BANK 1
10050  13 0053  51              ENTAL8*LIST3-1       PICK UP ADDRESS OF FRAME ROUTINE
10051  74 0053  52              STRADR*LOK+2
10052  50 7310  53              ENTSR*10
10053  34 0000  54              JP*0                 ADDRESS STORED BY LOK-2
10054  01 3004  55      LIST3   0*L97
10055  01 0442  56              0*L2
10056  01 0462  57              0*L3
10057  01 0473  60              0*L4
10060  01 0530  61              0*L5
10061  01 0552  62              0*L6
10062  01 0572  63              0*L7
10063  01 0603  64              0*L8
10064  01 0655  65              0*L9
10065  01 0705  66              0*L10
10066  01 0725  67              0*L11
10067  01 0736  70              0*L12
10070  01 0756  71              0*L13
10071  01 1006  72              0*L14
10072  01 1045  73              0*L15
10073  01 1114  74              0*L16
10074  01 1176  75              0*L17
10075  01 1220  76              0*L18
10076  01 1240  77              0*L19
10077  01 1251  100             0*L20
10100  01 1306  101             0*L21
10101  01 1330  102             0*L22
10102  01 1350  103             0*L23
10103  01 1361  104             0*L24
10104  01 1416  105             0*L25
10105  01 1440  106             0*L26
10106  01 1460  107             0*L27
10107  01 1471  110             0*L28
10110  01 1526  111             0*L29
10111  01 1550  112             0*L30
10112  01 1567  113             0*L31
10113  01 1600  114             0*L32
10114  01 1634  115             0*L33
10115  01 0442  116             0*L2
10116  01 0462  117             0*L3
10117  01 1650  120             0*L36
10120  01 1705  121             0*L37
```

```
10121   01 0552   122          0*L6
10122   01 0572   123          0*L7
10123   01 1720   124          0*L40
10124   01 1755   125          0*L41
10125   01 0705   126          0*L10
10126   01 0725   127          0*L11
10127   01 1770   130          0*L44
10130   01 2025   131          0*L45
10131   01 1006   132          0*L14
10132   01 1045   133          0*L15
10133   01 2041   134          0*L48
10134   01 2067   135          0*L49
10135   01 1220   136          0*L18
10136   01 1240   137          0*L19
10137   01 2102   140          0*L52
10140   01 2137   141          0*L53
10141   01 1330   142          0*L22
10142   01 1350   143          0*L23
10143   01 2152   144          0*L56
10144   01 2207   145          0*L57
10145   01 1440   146          0*L26
10146   01 1460   147          0*L27
10147   01 2222   150          0*L60
10150   01 2257   151          0*L61
10151   01 1550   152          0*L30
10152   01 1567   153          0*L31
10153   01 2272   154          0*L64
10154   01 2320   155          0*L65
10155   01 0442   156          0*L2
10156   01 0462   157          0*L3
10157   01 2334   160          0*L68
10160   01 2371   161          0*L69
10161   01 0552   162          0*L6
10162   01 0572   163          0*L7
10163   01 2404   164          0*L72
10164   01 2441   165          0*L73
10165   01 0705   166          0*L10
10166   01 0725   167          0*L11
10167   01 2454   170          0*L76
10170   01 2511   171          0*L77
10171   01 1006   172          0*L14
10172   01 1045   173          0*L15
10173   01 2525   174          0*L80
10174   01 2553   175          0*L81
10175   01 1220   176          0*L18
10176   01 1240   177          0*L19
10177   01 2566   200          0*L84
```

```
10200  01 2623  201            0*L85
10201  01 1330  202            0*L22
10202  01 1350  203            0*L23
10203  01 2636  204            0*L88
10204  01 2673  205            0*L89
10205  01 1440  206            0*L26
10206  01 1460  207            0*L27
10207  01 2706  210            0*L92
10210  01 2743  211            0*L93
10211  01 1550  212            0*L30
10212  01 1567  213            0*L31
10213  01 2756  214            0*L96
10214  12 0307  215  L1        ENTAL*GEM1E-12
10215  44 1424  216            STRAL*LBUF+213D
10216  12 0306  217            ENTAL*GEM1E-13
10217  44 1131  220            STRAL*LBUF+26D
10220  12 0305  221            ENTAL*GEM1E-14
10221  44 1275  222            STRAL*LBUF+126D
10222  12 0313  223  AA01      ENTAL*GEM1E-6
10223  44 1107  224            STRAL*LBUF+8D
10224  44 1140  225            STRAL*LBUF+33D
10225  44 1171  226            STRAL*LBUF+58D
10226  44 1222  227            STRAL*LBUF+83D
10227  44 1253  230            STRAL*LBUF+108D
10230  44 1304  231            STRAL*LBUF+133D
10231  44 1335  232            STRAL*LBUF+158D
10232  44 1366  233            STRAL*LBUF+183D
10233  44 1417  234            STRAL*LBUF+208D
10234  44 1450  235            STRAL*LBUF+233D
10235  44 1501  236            STRAL*LBUF+258D
10236  44 1532  237            STRAL*LBUF+283D
10237  44 1563  240            STRAL*LBUF+308D
10240  44 1614  241            STRAL*LBUF+333D
10241  44 1645  242            STRAL*LBUF+358D
10242  44 1676  243            STRAL*LBUF+383D
10243  44 1727  244            STRAL*LBUF+408D
10244  44 1760  245            STRAL*LBUF+433D
10245  44 2011  246            STRAL*LBUF+458D
10246  44 2042  247            STRAL*LBUF+483D
10247  44 1250  250            STRAL*LBUF+105D          UPDATE SET
10250  12 0314  251  MAP       ENTAL*GEM1E-5
10251  50 7206  252            ENTICR*6
10252  10 4307  253            ENTAU*MASK2
10253  06 4252  254            CMSK*MAPPAT
10254  63 0257  255            JPNOT*NEWPAT
10255  73 0316  256            BJP*SENDIT
10256  34 0436  257            JP*EXIT1
```

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10257  06 4233  260      NEWPAT  CMSK*ZERO
10260  61 0301  261              JPEQ*YESMAP
10261  06 4253  262              CMSK*MUP
10262  61 0306  263              JPEQ*YESMUP
10263  50 7204  264              ENTICR*4
10264  36 0003  265              ENTBK*3
10265  50 7205  266              ENTICR*5
10266  36 0006  267              ENTBK*6
10267  50 4612  270              LSHAL*12
10270  10 4233  271              ENTAU*ZERO
10271  50 4701  272      LOOP    LSHA*1
10272  60 0300  273              JPAUZ*LOOP1
10273  50 7204  274              ENTICR*4
10274  73 0276  275              BJP*LOK+2
10275  34 0306  276              JP*YESMUP
10276  50 7205  277              ENTICR*5
10277  10 4233  300              ENTAU*ZERO
10300  73 0271  301      LOOP1   BJP*LOOP
10301  50 7206  302      YESMAP  ENTICR*6
10302  36 0000  303              ENTBK*0
10303  70 0000  304              ENTALK*0
10304  44 4252  305              STRAL*MAPPAT
10305  34 0316  306              JP*SENDIT
10306  50 7206  307      YESMUP  ENTICR*6
10307  12 4253  310              ENTAL*MUP
10310  44 4252  311              STRAL*MAPPAT
10311  73 0316  312              BJP*SENDIT
10312  36 0001  313              ENTBK*1
10313  34 0436  314              JP*EXIT1
10314  00 0000  315              0*0
10315  00 0000  316              0*0
10316  44 1105  317      SENDIT  STRAL*LBUF+6D
10317  44 1113  320              STRAL*LBUF+12D
10320  44 1121  321              STRAL*LBUF+18D
10321  44 1127  322              STRAL*LBUF+24D
10322  44 1136  323              STRAL*LBUF+31D
10323  44 1144  324              STRAL*LBUF+37D
10324  44 1152  325              STRAL*LBUF+43D
10325  44 1160  326              STRAL*LBUF+49D
10326  44 1167  327              STRAL*LBUF+56D
10327  44 1175  330              STRAL*LBUF+62D
10330  44 1203  331              STRAL*LBUF+68D
10331  44 1211  332              STRAL*LBUF+74D
10332  44 1220  333              STRAL*LBUF+81D
10333  44 1226  334              STRAL*LBUF+87D
10334  44 1234  335              STRAL*LBUF+93D
10335  44 1242  336              STRAL*LBUF+99D
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10336	44	1251	337	STRAL*LBUF+106D
10337	44	1257	340	STRAL*LBUF+112D
10340	44	1265	341	STRAL*LBUF+118D
10341	44	1273	342	STRAL*LBUF+124D
10342	44	1302	343	STRAL*LBUF+131D
10343	44	1310	344	STRAL*LBUF+137D
10344	44	1316	345	STRAL*LBUF+143D
10345	44	1324	346	STRAL*LBUF+149D
10346	44	1333	347	STRAL*LBUF+156D
10347	44	1341	350	STRAL*LBUF+162D
10350	44	1347	351	STRAL*LBUF+168D
10351	44	1355	352	STRAL*LBUF+174D
10352	44	1364	353	STRAL*LBUF+181D
10353	44	1372	354	STRAL*LBUF+187D
10354	44	1400	355	STRAL*LBUF+193D
10355	44	1406	356	STRAL*LBUF+199D
10356	44	1415	357	STRAL*LBUF+206D
10357	44	1423	360	STRAL*LBUF+212D
10360	44	1431	361	STRAL*LBUF+218D
10361	44	1437	362	STRAL*LBUF+224D
10362	44	1446	363	STRAL*LBUF+231D
10363	44	1454	364	STRAL*LBUF+237D
10364	44	1462	365	STRAL*LBUF+243D
10365	44	1470	366	STRAL*LBUF+249D
10366	44	1477	367	STRAL*LBUF+256D
10367	44	1505	370	STRAL*LBUF+262D
10370	44	1513	371	STRAL*LBUF+268D
10371	44	1521	372	STRAL*LBUF+274D
10372	44	1530	373	STRAL*LBUF+281D
10373	44	1536	374	STRAL*LBUF+287D
10374	44	1544	375	STRAL*LBUF+293D
10375	44	1552	376	STRAL*LBUF+299D
10376	44	1561	377	STRAL*LBUF+306D
10377	44	1567	400	STRAL*LBUF+312D
10400	44	1575	401	STRAL*LBUF+318D
10401	44	1603	402	STRAL*LBUF+324D
10402	44	1612	403	STRAL*LBUF+331D
10403	44	1620	404	STRAL*LBUF+337D
10404	44	1626	405	STRAL*LBUF+343D
10405	44	1634	406	STRAL*LBUF+349D
10406	44	1643	407	STRAL*LBUF+356D
10407	44	1651	410	STRAL*LBUF+362D
10410	44	1657	411	STRAL*LBUF+368D
10411	44	1665	412	STRAL*LBUF+374D
10412	44	1674	413	STRAL*LBUF+381D
10413	44	1702	414	STRAL*LBUF+387D
10414	44	1710	415	STRAL*LBUF+393D

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10415  44 1716  416              STRAL*LBUF+399D
10416  44 1725  417              STRAL*LBUF+406D
10417  44 1733  420              STRAL*LBUF+412D
10420  44 1741  421              STRAL*LBUF+418D
10421  44 1747  422              STRAL*LBUF+424D
10422  44 1756  423              STRAL*LBUF+431D
10423  44 1764  424              STRAL*LBUF+437D
10424  44 1772  425              STRAL*LBUF+443D
10425  44 2000  426              STRAL*LBUF+449D
10426  44 2007  427              STRAL*LBUF+456D
10427  44 2015  430              STRAL*LBUF+462D
10430  44 2023  431              STRAL*LBUF+468D
10431  44 2031  432              STRAL*LBUF+474D
10432  44 2040  433              STRAL*LBUF+481D
10433  44 2046  434              STRAL*LBUF+487D
10434  44 2054  435              STRAL*LBUF+493D
10435  44 2062  436              STRAL*LBUF+499D
10436  50 7300  437     EXIT1    ENTSR*0
10437  55 0000  440              IJP*LISTGR
10440  00 0000  441              0*0
10441  00 0000  442              0*0
10442  12 0407  443     L2       ENTAL*GEM2E-12
10443  44 1422  444              STRAL*LBUF+211D
10444  12 0406  445              ENTAL*GEM2E-13
10445  44 1327  446              STRAL*LBUF+152D
10446  12 0405  447              ENTAL*GEM2E-14
10447  44 1757  450              STRAL*LBUF+432D
10450  12 0402  451              ENTAL*GEM2E-17
10451  44 1605  452              STRAL*LBUF+326D
10452  12 0401  453              ENTAL*GEM2E-20
10453  44 1751  454              STRAL*LBUF+426D
10454  12 0400  455              ENTAL*GEM2E-21
10455  44 1763  456              STRAL*LBUF+436D
10456  12 0414  457              ENTAL*GEM2E-5
10457  34 0251  460              JP*MAP+1
10460  00 0000  461              0*0
10461  00 0000  462              0*0
10462  12 0307  463     L3       ENTAL*GEM1E-12
10463  44 1421  464              STRAL*LBUF+210D
10464  12 0306  465              ENTAL*GEM1E-13
10465  44 1736  466              STRAL*LBUF+415D
10466  12 0305  467              ENTAL*GEM1E-14
10467  44 1746  470              STRAL*LBUF+423D
10470  34 0250  471              JP*MAP
10471  00 0000  472              0*0
10472  00 0000  473              0*0
10473  12 0407  474     L4       ENTAL*GEM2E-12
```

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10474  44 1151  475              STRAL*LBUF+42D
10475  12 0406  476              ENTAL*GEM2E-13
10476  44 1132  477              STRAL*LBUF+27D
10477  12 0405  500              ENTAL*GEM2E-14
10500  44 1427  501              STRAL*LBUF+216D
10501  12 0402  502              ENTAL*GEM2E-17
10502  44 1625  503              STRAL*LBUF+342D
10503  12 0401  504              ENTAL*GEM2E-20
10504  44 1551  505              STRAL*LBUF+298D
10505  12 0400  506              ENTAL*GEM2E-21
10506  44 1553  507              STRAL*LBUF+300D
10507  12 0000  510     RL4AD    ENTAL*0
10510  02 4003  511              CMAL*T103D
10511  61 3022  512              JPEQ*TEMPR
10512  02 4004  513              CMAL*T104D
10513  61 3022  514              JPEQ*TEMPR
10514  02 4005  515              CMAL*T105D
10515  61 3022  516              JPEQ*TEMPR
10516  12 0416  517              ENTAL*GEM2E-3
10517  44 1250  520              STRAL*LBUF+105D
10520  12 0417  521              ENTAL*GEM2E-2
10521  44 1247  522              STRAL*LBUF+104D
10522  12 0420  523              ENTAL*GEM2E-1
10523  44 1246  524              STRAL*LBUF+103D
10524  12 0414  525     L4L      ENTAL*GEM2E-5
10525  34 0251  526              JP*MAP+1
10526  00 0000  527              0*0
10527  00 0000  530              0*0
10530  12 4116  531     L5       ENTAL*TEMP+4
10531  61 0541  532              JPALZ*L5D1
10532  12 4112  533              ENTAL*TEMP
10533  44 1246  534              STRAL*LBUF+103D
10534  12 4113  535              ENTAL*TEMP+1
10535  44 1247  536              STRAL*LBUF+104D
10536  12 4114  537              ENTAL*TEMP+2
10537  44 1250  540              STRAL*LBUF+105D
10540  40 4116  541     L5D      CL*TEMP+4
10541  12 0307  542     L5D1     ENTAL*GEM1E-12
10542  44 1157  543              STRAL*LBUF+48D
10543  12 0306  544              ENTAL*GEM1E-13
10544  44 1274  545              STRAL*LBUF+125D
10545  12 0305  546              ENTAL*GEM1E-14
10546  44 1303  547              STRAL*LBUF+132D
10547  34 0222  550              JP*AA01
10550  00 0000  551              0*0
10551  00 0000  552              0*0
10552  12 0407  553     L6       ENTAL*GEM2E-12
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10553  44 1652  554            STRAL*LBUF+363D
10554  12 0406  555            ENTAL*GEM2E-13
10555  44 1334  556            STRAL*LBUF+157D
10556  12 0405  557            ENTAL*GEM2E-14
10557  44 1263  560            STRAL*LBUF+116D
10560  12 0402  561            ENTAL*GEM2E-17
10561  44 1606  562            STRAL*LBUF+327D
10562  12 0401  563            ENTAL*GEM2E-20
10563  44 1323  564            STRAL*LBUF+148D
10564  12 0400  565            ENTAL*GEM2E-21
10565  44 1245  566            STRAL*LBUF+102D
10566  12 0414  567            ENTAL*GEM2E-5
10567  34 0251  570            JP*MAP+1
10570  00 0000  571            0*0
10571  00 0000  572            0*0
10572  12 0307  573     L7     ENTAL*GEM1E-12
10573  44 1161  574            STRAL*LBUF+50D
10574  12 0306  575            ENTAL*GEM1E-13
10575  44 1737  576            STRAL*LBUF+416D
10576  12 0305  577            ENTAL*GEM1E-14
10577  44 1405  600            STRAL*LBUF+198D
10600  34 0250  601            JP*MAP
10601  00 0000  602            0*0
10602  00 0000  603            0*0
10603  12 0407  604     L8     ENTAL*GEM2E-12
10604  44 1377  605            STRAL*LBUF+192D
10605  12 0406  606            ENTAL*GEM2E-13
10606  44 1162  607            STRAL*LBUF+51D
10607  12 0405  610            ENTAL*GEM2E-14
10610  44 1430  611            STRAL*LBUF+217D
10611  12 0402  612            ENTAL*GEM2E-17
10612  44 1632  613            STRAL*LBUF+347D
10613  12 0401  614            ENTAL*GEM2E-20
10614  44 1134  615            STRAL*LBUF+29D
10615  12 0400  616            ENTAL*GEM2E-21
10616  44 1573  617            STRAL*LBUF+316D
10617  12 0000  620     RL8AD  ENTAL*0
10620  50 3400  621            SIL*0
10621  02 4000  622            CMAL*T69D
10622  61 3020  623            JPEQ*TEMPR8
10623  02 4001  624            CMAL*T70D
10624  61 3020  625            JPEQ*TEMPR8
10625  02 4002  626            CMAL*T71D
10626  61 3020  627            JPEQ*TEMPR8
10627  02 4041  630            CMAL*T319D
10630  61 3020  631            JPEQ*TEMPR8
10631  02 4042  632            CMAL*T320D
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10632  61 3020  633          JPEQ*TEMPR8
10633  02 4043  634          CMAL*T321D
10634  61 3020  635          JPEQ*TEMPR8
10635  12 0416  636          ENTAL*GEM2E-3
10636  44 1206  637          STRAL*LBUF+71D
10637  44 1600  640          STRAL*LBUF+321D
10640  12 0417  641          ENTAL*GEM2E-2
10641  44 1205  642          STRAL*LBUF+70D
10642  44 1577  643          STRAL*LBUF+320D
10643  12 0420  644          ENTAL*GEM2E-1
10644  44 1204  645          STRAL*LBUF+69D
10645  44 1576  646          STRAL*LBUF+319D
10646  12 4120  647          ENTAL*BIGBEN
10647  44 4117  650          STRAL*TIMET
10650  50 3000  651          RIL*0
10651  12 0414  652          ENTAL*GEM2E-5
10652  34 0251  653          JP*MAP+1
10653  00 0000  654          0*0
10654  00 0000  655          0*0
10655  12 4116  656  L9      ENTAL*TEMP+4
10656  61 0674  657          JPALZ*L9D1
10657  12 4112  660          ENTAL*TEMP
10660  44 1204  661          STRAL*LBUF+69D
10661  44 1576  662          STRAL*LBUF+319D
10662  12 4113  663          ENTAL*TEMP+1
10663  44 1205  664          STRAL*LBUF+70D
10664  44 1577  665          STRAL*LBUF+320D
10665  12 4114  666          ENTAL*TEMP+2
10666  44 1206  667          STRAL*LBUF+71D
10667  44 1600  670          STRAL*LBUF+321D
10670  12 4115  671          ENTAL*TEMP+3
10671  44 4117  672          STRAL*TIMET
10672  40 4116  673  L9D     CL*TEMP+4
10673  40 4115  674          CL*TEMP+3
10674  12 0307  675  L9D1    ENTAL*GEM1E-12
10675  44 1272  676          STRAL*LBUF+123D
10676  12 0306  677          ENTAL*GEM1E-13
10677  44 1163  700          STRAL*LBUF+52D
10700  12 0305  701          ENTAL*GEM1E-14
10701  44 1305  702          STRAL*LBUF+134D
10702  34 0222  703          JP*AA01
10703  00 0000  704          0*0
10704  00 0000  705          0*0
10705  12 0407  706  L10     ENTAL*GEM2E-12
10706  44 1654  707          STRAL*LBUF+365D
10707  12 0406  710          ENTAL*GEM2E-13
10710  44 1636  711          STRAL*LBUF+351D
```

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10711  12 0405  712          ENTAL*GEM2E-14
10712  44 1264  713          STRAL*LBUF+117D
10713  12 0402  714          ENTAL*GEM2E-17
10714  44 1613  715          STRAL*LBUF+332D
10715  12 0401  716          ENTAL*GEM2E-20
10716  44 1325  717          STRAL*LBUF+150D
10717  12 0400  720          ENTAL*GEM2E-21
10720  44 1666  721          STRAL*LBUF+375D
10721  12 0414  722          ENTAL*GEM2E-5
10722  34 0251  723          JP*MAP+1
10723  00 0000  724          0*0
10724  00 0000  725          0*0
10725  12 0307  726    L11   ENTAL*GEM1E-12
10726  44 1346  727          STRAL*LBUF+167D
10727  12 0306  730          ENTAL*GEM1E-13
10730  44 1745  731          STRAL*LBUF+422D
10731  12 0305  732          ENTAL*GEM1E-14
10732  44 1407  733          STRAL*LBUF+200D
10733  34 0250  734          JP*MAP
10734  00 0000  735          0*0
10735  00 0000  736          0*0
10736  12 0407  737    L12   ENTAL*GEM2E-12
10737  44 1200  740          STRAL*LBUF+65D
10740  12 0406  741          ENTAL*GEM2E-13
10741  44 1340  742          STRAL*LBUF+161D
10742  12 0405  743          ENTAL*GEM2E-14
10743  44 1435  744          STRAL*LBUF+222D
10744  12 0402  745          ENTAL*GEM2E-17
10745  44 1633  746          STRAL*LBUF+348D
10746  12 0401  747          ENTAL*GEM2E-20
10747  44 1135  750          STRAL*LBUF+30D
10750  12 0400  751          ENTAL*GEM2E-21
10751  44 1154  752          STRAL*LBUF+45D
10752  12 0414  753          ENTAL*GEM2E-5
10753  34 0251  754          JP*MAP+1
10754  00 0000  755          0*0
10755  00 0000  756          0*0
10756  12 0307  757    L13   ENTAL*GEM1E-12
10757  44 1201  760          STRAL*LBUF+66D
10760  12 0306  761          ENTAL*GEM1E-13
10761  44 1360  762          STRAL*LBUF+177D
10762  12 0305  763          ENTAL*GEM1E-14
10763  44 1314  764          STRAL*LBUF+141D
10764  12 0320  765    L13D  ENTAL*GEM1E-1
10765  44 1156  766          STRAL*LBUF+47D
10766  44 1550  767          STRAL*LBUF+297D
10767  12 0317  770          ENTAL*GEM1E-2
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10770  44 1137  771            STRAL*LBUF+32D
10771  44 1531  772            STRAL*LBUF+282D
10772  12 0316  773            ENTAL*GEM1E-3
10773  44 1116  774            STRAL*LBUF+15D
10774  44 1510  775            STRAL*LBUF+265D
10775  12 0312  776            ENTAL*GEM1E-7
10776  44 1142  777            STRAL*LBUF+35D
10777  44 1534  1000           STRAL*LBUF+285D
11000  12 0311  1001           ENTAL*GEM1E-10
11001  44 1111  1002           STRAL*LBUF+10D
11002  44 1503  1003           STRAL*LBUF+260D
11003  34 0222  1004           JP*AA01
11004  00 0000  1005           0*0
11005  00 0000  1006           0*0
11006  12 0407  1007   L14     ENTAL*GEM2E-12
11007  44 1655  1010           STRAL*LBUF+366D
11010  12 0406  1011           ENTAL*GEM2E-13
11011  44 1637  1012           STRAL*LBUF+352D
11012  12 0405  1013           ENTAL*GEM2E-14
11013  44 1271  1014           STRAL*LBUF+122D
11014  12 0402  1015           ENTAL*GEM2E-17
11015  44 1615  1016           STRAL*LBUF+334D
11016  12 0401  1017           ENTAL*GEM2E-20
11017  44 1656  1020           STRAL*LBUF+367D
11020  12 0400  1021           ENTAL*GEM2E-21
11021  44 1663  1022           STRAL*LBUF+372D
11022  12 0420  1023   L14D    ENTAL*GEM2E-1
11023  44 1236  1024           STRAL*LBUF+95D
11024  44 1630  1025           STRAL*LBUF+345D
11025  12 0417  1026           ENTAL*GEM2E-2
11026  44 1216  1027           STRAL*LBUF+79D
11027  44 1610  1030           STRAL*LBUF+329D
11030  12 0416  1031           ENTAL*GEM2E-3
11031  44 1176  1032           STRAL*LBUF+63D
11032  44 1570  1033           STRAL*LBUF+313D
11033  12 0412  1034           ENTAL*GEM2E-7
11034  44 1466  1035           STRAL*LBUF+247D
11035  44 2060  1036           STRAL*LBUF+497D
11036  12 0411  1037           ENTAL*GEM2E-10
11037  44 1173  1040           STRAL*LBUF+60D
11040  44 1565  1041           STRAL*LBUF+310D
11041  12 0414  1042           ENTAL*GEM2E-5
11042  34 0251  1043           JP*MAP+1
11043  00 0000  1044           0*0
11044  00 0000  1045           0*0
11045  12 0307  1072   L15     ENTAL*GEM1E-12
11046  44 1353  1073           STRAL*LBUF+172D
```

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11047  12 0306  1074          ENTAL*GEM1E-13
11050  44 1765  1075          STRAL*LBUF+438D
11051  12 0305  1076          ENTAL*GEM1E-14
11052  44 1410  1077          STRAL*LBUF+201D
11053  12 0320  1100    L15D  ENTAL*GEM1E-1
11054  44 1456  1101          STRAL*LBUF+239D
11055  44 2050  1102          STRAL*LBUF+489D
11056  12 0317  1103          ENTAL*GEM1E-2
11057  44 1436  1104          STRAL*LBUF+223D
11060  44 2030  1105          STRAL*LBUF+473D
11061  12 0316  1106          ENTAL*GEM1E-3
11062  44 1416  1107          STRAL*LBUF+207D
11063  44 2010  1110          STRAL*LBUF+457D
11064  12 0315  1111          ENTAL*GEM1E-4
11065  44 1261  1112          STRAL*LBUF+114D
11066  44 1653  1113          STRAL*LBUF+364D
11067  12 0313  1114          ENTAL*GEM1E-6
11070  44 1376  1115          STRAL*LBUF+191D
11071  44 1770  1116          STRAL*LBUF+441D
11072  12 0312  1117          ENTAL*GEM1E-7
11073  44 1356  1120          STRAL*LBUF+175D
11074  44 1750  1121          STRAL*LBUF+425D
11075  12 0311  1122          ENTAL*GEM1E-10
11076  44 1336  1123          STRAL*LBUF+159D
11077  44 1730  1124          STRAL*LBUF+409D
11100  12 0302  1125          ENTAL*GEM1E-17
11101  44 1315  1126          STRAL*LBUF+142D
11102  44 1707  1127          STRAL*LBUF+392D
11103  12 0301  1130          ENTAL*GEM1E-20
11104  44 1276  1131          STRAL*LBUF+127D
11105  44 1670  1132          STRAL*LBUF+377D
11106  12 0300  1133          ENTAL*GEM1E-21
11107  44 1256  1134          STRAL*LBUF+111D
11110  44 1650  1135          STRAL*LBUF+361D
11111  34 0250  1136          JP*MAP
11112  00 0000  1137          0*0
11113  00 0000  1140          0*0
11114  12 0402  1141    L16   ENTAL*GEM2E-17
11115  44 1635  1142          STRAL*LBUF+350D
11116  12 0401  1143          ENTAL*GEM2E-20
11117  44 1141  1144          STRAL*LBUF+34D
11120  12 0400  1145          ENTAL*GEM2E-21
11121  44 1647  1146          STRAL*LBUF+360D
11122  12 0000  1147    RL16AD ENTAL*0
11123  02 4006  1150          CMAL*T144D
11124  61 3022  1151          JPEQ*TEMPR
11125  02 4007  1152          CMAL*T145D
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11126  61 3022  1153          JPEQ*TEMPR
11127  02 4010  1154          CMAL*T146D
11130  61 3022  1155          JPEQ*TEMPR
11131  12 0416  1156          ENTAL*GEM2E-3
11132  44 1321  1157          STRAL*LBUF+146D
11133  12 0417  1160          ENTAL*GEM2E-2
11134  44 1320  1161          STRAL*LBUF+145D
11135  12 0420  1162          ENTAL*GEM2E-1
11136  44 1317  1163          STRAL*LBUF+144D
11137  12 0407  1164  L16R    ENTAL*GEM2E-12
11140  44 1202  1165          STRAL*LBUF+67D
11141  12 0406  1166          ENTAL*GEM2E-13
11142  44 1342  1167          STRAL*LBUF+163D
11143  12 0405  1170          ENTAL*GEM2E-14
11144  44 1440  1171          STRAL*LBUF+225D
11145  12 0421  1172  L16D    ENTAL*GEM2E
11146  44 1177  1173          STRAL*LBUF+64D
11147  44 1571  1174          STRAL*LBUF+314D
11150  12 0415  1175          ENTAL*GEM2E-4
11151  44 1343  1176          STRAL*LBUF+164D
11152  44 1735  1177          STRAL*LBUF+414D
11153  12 0413  1200          ENTAL*GEM2E-6
11154  44 1312  1201          STRAL*LBUF+139D
11155  44 1704  1202          STRAL*LBUF+389D
11156  12 0412  1203          ENTAL*GEM2E-7
11157  44 1461  1204          STRAL*LBUF+242D
11160  44 2053  1205          STRAL*LBUF+492D
11161  12 0411  1206          ENTAL*GEM2E-10
11162  44 1224  1207          STRAL*LBUF+85D
11163  44 1616  1210          STRAL*LBUF+335D
11164  12 0410  1211          ENTAL*GEM2E-11
11165  44 1146  1212          STRAL*LBUF+39D
11166  44 1540  1213          STRAL*LBUF+289D
11167  12 0404  1214          ENTAL*GEM2E-15
11170  44 1115  1215          STRAL*LBUF+14D
11171  44 1507  1216          STRAL*LBUF+264D
11172  12 0414  1217          ENTAL*GEM2E-5
11173  34 0251  1220          JP*MAP+1
11174  00 0000  1221          0*0
11175  00 0000  1222          0*0
11176  12 4116  1223  L17     ENTAL*TEMP+4
11177  61 1207  1224          JPALZ*L17D1
11200  12 4112  1225          ENTAL*TEMP
11201  44 1317  1226          STRAL*LBUF+144D
11202  12 4113  1227          ENTAL*TEMP+1
11203  44 1320  1230          STRAL*LBUF+145D
11204  12 4114  1231          ENTAL*TEMP+2
```

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11205  44 1321  1232          STRAL*LBUF+146D
11206  40 4116  1233  L17D    CL*TEMP+4
11207  12 0307  1234  L17D1   ENTAL*GEM1E-12
11210  44 1207  1235          STRAL*LBUF+72D
11211  12 0306  1236          ENTAL*GEM1E-13
11212  44 1365  1237          STRAL*LBUF+182D
11213  12 0305  1240          ENTAL*GEM1E-14
11214  44 1322  1241          STRAL*LBUF+147D
11215  34 0222  1242          JP*AA01
11216  00 0000  1243          0*0
11217  00 0000  1244          0*0
11220  12 0407  1245  L18     ENTAL*GEM2E-12
11221  44 1210  1246          STRAL*LBUF+73D
11222  12 0406  1247          ENTAL*GEM2E-13
11223  44 1721  1250          STRAL*LBUF+402D
11224  12 0405  1251          ENTAL*GEM2E-14
11225  44 1371  1252          STRAL*LBUF+186D
11226  12 0402  1253          ENTAL*GEM2E-17
11227  44 1617  1254          STRAL*LBUF+336D
11230  12 0401  1255          ENTAL*GEM2E-20
11231  44 1311  1256          STRAL*LBUF+138D
11232  12 0400  1257          ENTAL*GEM2E-21
11233  44 1715  1260          STRAL*LBUF+398D
11234  12 0414  1261          ENTAL*GEM2E-5
11235  34 0251  1262          JP*MAP+1
11236  00 0000  1263          0*0
11237  00 0000  1264          0*0
11240  12 0307  1265  L19     ENTAL*GEM1E-12
11241  44 1213  1266          STRAL*LBUF+76D
11242  12 0306  1267          ENTAL*GEM1E-13
11243  44 1212  1270          STRAL*LBUF+75D
11244  12 0305  1271          ENTAL*GEM1E-14
11245  44 1411  1272          STRAL*LBUF+202D
11246  34 0250  1273          JP*MAP
11247  00 0000  1274          0*0
11250  00 0000  1275          0*0
11251  12 0407  1276  L20     ENTAL*GEM2E-12
11252  44 1214  1277          STRAL*LBUF+77D
11253  12 0406  1300          ENTAL*GEM2E-13
11254  44 1367  1301          STRAL*LBUF+184D
11255  12 0405  1302          ENTAL*GEM2E-14
11256  44 1441  1303          STRAL*LBUF+226D
11257  12 0402  1304          ENTAL*GEM2E-17
11260  44 1667  1305          STRAL*LBUF+376D
11261  12 0401  1306          ENTAL*GEM2E-20
11262  44 1147  1307          STRAL*LBUF+40D
11263  12 0400  1310          ENTAL*GEM2E-21
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11264  44 1664  1311          STRAL*LBUF+373D
11265  12 0000  1312  RL20AD   ENTAL*0
11266  02 4011  1313          CMAL*T153D
11267  61 3022  1314          JPEQ*TEMPR
11270  02 4012  1315          CMAL*T154D
11271  61 3022  1316          JPEQ*TEMPR
11272  02 4013  1317          CMAL*T155D
11273  61 3022  1320          JPEQ*TEMPR
11274  12 0416  1321          ENTAL*GEM2E-3
11275  44 1332  1322          STRAL*LBUF+155D
11276  12 0417  1323          ENTAL*GEM2E-2
11277  44 1331  1324          STRAL*LBUF+154D
11300  12 0420  1325          ENTAL*GEM2E-1
11301  44 1330  1326          STRAL*LBUF+153D
11302  12 0414  1327          ENTAL*GEM2E-5
11303  34 0251  1330          JP*MAP+1
11304  00 0000  1331          0*0
11305  00 0000  1332          0*0
11306  12 4116  1333  L21     ENTAL*TEMP+4
11307  61 1317  1334          JPALZ*L21D1
11310  12 4112  1335          ENTAL*TEMP
11311  44 1330  1336          STRAL*LBUF+153D
11312  12 4113  1337          ENTAL*TEMP+1
11313  44 1331  1340          STRAL*LBUF+154D
11314  12 4114  1341          ENTAL*TEMP+2
11315  44 1332  1342          STRAL*LBUF+155D
11316  40 4116  1343  L21D    CL*TEMP+4
11317  12 0307  1344  L21D1   ENTAL*GEM1E-12
11320  44 1223  1345          STRAL*LBUF+84D
11321  12 0306  1346          ENTAL*GEM1E-13
11322  44 1221  1347          STRAL*LBUF+82D
11323  12 0305  1350          ENTAL*GEM1E-14
11324  44 1326  1351          STRAL*LBUF+151D
11325  34 0222  1352          JP*AA01
11326  00 0000  1353          0*0
11327  00 0000  1354          0*0
11330  12 0407  1355  L22     ENTAL*GEM2E-12
11331  44 1646  1356          STRAL*LBUF+359D
11332  12 0406  1357          ENTAL*GEM2E-13
11333  44 1726  1360          STRAL*LBUF+407D
11334  12 0405  1361          ENTAL*GEM2E-14
11335  44 1262  1362          STRAL*LBUF+115D
11336  12 0402  1363          ENTAL*GEM2E-17
11337  44 1621  1364          STRAL*LBUF+338D
11340  12 0401  1365          ENTAL*GEM2E-20
11341  44 1307  1366          STRAL*LBUF+136D
11342  12 0400  1367          ENTAL*GEM2E-21
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11343  44 1644  1370          STRAL*LBUF+357D
11344  12 0414  1371          ENTAL*GEM2E-5
11345  34 0251  1372          JP*MAP+1
11346  00 0000  1373          0*0
11347  00 0000  1374          0*0
11350  12 0307  1375    L23   ENTAL*GEM1E-12
11351  44 1227  1376          STRAL*LBUF+88D
11352  12 0306  1377          ENTAL*GEM1E-13
11353  44 1225  1400          STRAL*LBUF+86D
11354  12 0305  1401          ENTAL*GEM1E-14
11355  44 1404  1402          STRAL*LBUF+197D
11356  34 0250  1403          JP*MAP
11357  00 0000  1404          0*0
11360  00 0000  1405          0*0
11361  12 0407  1406    L24   ENTAL*GEM2E-12
11362  44 1230  1407          STRAL*LBUF+89D
11363  12 0406  1410          ENTAL*GEM2E-13
11364  44 1344  1411          STRAL*LBUF+165D
11365  12 0405  1412          ENTAL*GEM2E-14
11366  44 1244  1413          STRAL*LBUF+101D
11367  12 0402  1414          ENTAL*GEM2E-17
11370  44 1677  1415          STRAL*LBUF+384D
11371  12 0401  1416          ENTAL*GEM2E-20
11372  44 1150  1417          STRAL*LBUF+41D
11373  12 0400  1420          ENTAL*GEM2E-21
11374  44 1675  1421          STRAL*LBUF+382D
11375  12 0000  1422    RL24AD ENTAL*0
11376  02 4014  1423          CMAL*T169D
11377  61 3022  1424          JPEQ*TEMPR
11400  02 4015  1425          CMAL*T170D
11401  61 3022  1426          JPEQ*TEMPR
11402  02 4016  1427          CMAL*T171D
11403  61 3022  1430          JPEQ*TEMPR
11404  12 0416  1431          ENTAL*GEM2E-3
11405  44 1352  1432          STRAL*LBUF+171D
11406  12 0417  1433          ENTAL*GEM2E-2
11407  44 1351  1434          STRAL*LBUF+170D
11410  12 0420  1435          ENTAL*GEM2E-1
11411  44 1350  1436          STRAL*LBUF+169D
11412  12 0414  1437          ENTAL*GEM2E-5
11413  34 0251  1440          JP*MAP+1
11414  00 0000  1441          0*0
11415  00 0000  1442          0*0
11416  12 4116  1443    L25   ENTAL*TEMP+4
11417  61 1427  1444          JPALZ*L25D1
11420  12 4112  1445          ENTAL*TEMP
11421  44 1350  1446          STRAL*LBUF+169D
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11422  12 4113  1447            ENTAL*TEMP+1
11423  44 1351  1450            STRAL*LBUF+170D
11424  12 4114  1451            ENTAL*TEMP+2
11425  44 1352  1452            STRAL*LBUF+171D
11426  40 4116  1453  L25D      CL*TEMP+4
11427  12 0307  1454  L25D1     ENTAL*GEM1E-12
11430  44 1375  1455            STRAL*LBUF+190D
11431  12 0306  1456            ENTAL*GEM1E-13
11432  44 1231  1457            STRAL*LBUF+90D
11433  12 0305  1460            ENTAL*GEM1E-14
11434  44 1425  1461            STRAL*LBUF+214D
11435  34 0222  1462            JP*AA01
11436  00 0000  1463            0*0
11437  00 0000  1464            0*0
11440  12 0407  1465  L26       ENTAL*GEM2E-12
11441  44 1232  1466            STRAL*LBUF+91D
11442  12 0406  1467            ENTAL*GEM2E-13
11443  44 1732  1470            STRAL*LBUF+411D
11444  12 0405  1471            ENTAL*GEM2E-14
11445  44 1373  1472            STRAL*LBUF+188D
11446  12 0402  1473            ENTAL*GEM2E-17
11447  44 1623  1474            STRAL*LBUF+340D
11450  12 0401  1475            ENTAL*GEM2E-20
11451  44 1622  1476            STRAL*LBUF+339D
11452  12 0400  1477            ENTAL*GEM2E-21
11453  44 1717  1500            STRAL*LBUF+400D
11454  12 0414  1501            ENTAL*GEM2E-5
11455  34 0251  1502            JP*MAP+1
11456  00 0000  1503            0*0
11457  00 0000  1504            0*0
11460  12 0307  1505  L27       ENTAL*GEM1E-12
11461  44 1354  1506            STRAL*LBUF+173D
11462  12 0306  1507            ENTAL*GEM1E-13
11463  44 1233  1510            STRAL*LBUF+92D
11464  12 0305  1511            ENTAL*GEM1E-14
11465  44 1420  1512            STRAL*LBUF+209D
11466  34 0250  1513            JP*MAP
11467  00 0000  1514            0*0
11470  00 0000  1515            0*0
11471  12 0407  1516  L28       ENTAL*GEM2E-12
11472  44 1313  1517            STRAL*LBUF+140D
11473  12 0406  1520            ENTAL*GEM2E-13
11474  44 1345  1521            STRAL*LBUF+156D
11475  12 0405  1522            ENTAL*GEM2E-14
11476  44 1767  1523            STRAL*LBUF+440D
11477  12 0402  1524            ENTAL*GEM2E-17
11500  44 1700  1525            STRAL*LBUF+385D
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11560  12 0401  1605          ENTAL*GEM2E-20
11561  44 1752  1606          STRAL*LBUF+427D
11562  12 0400  1607          ENTAL*GEM2E-21
11563  44 1720  1610          STRAL*LBUF+401D
11564  34 1022  1611          JP*L14D
11565  00 0000  1612          0*0
11566  00 0000  1613          0*0
11567  12 0307  1614  L31      ENTAL*GEM1E-12
11570  44 1357  1615          STRAL*LBUF+176D
11571  12 0306  1616          ENTAL*GEM1E-13
11572  44 1243  1617          STRAL*LBUF+100D
11573  12 0305  1620          ENTAL*GEM1E-14
11574  44 1766  1621          STRAL*LBUF+439D
11575  34 1053  1622          JP*L15D
11576  00 0000  1623          0*0
11577  00 0000  1624          0*0
11600  12 0402  1625  L32      ENTAL*GEM2E-17
11601  44 1701  1626          STRAL*LBUF+386D
11602  12 0401  1627          ENTAL*GEM2E-20
11603  44 1560  1630          STRAL*LBUF+305D
11604  12 0400  1631          ENTAL*GEM2E-21
11605  44 1574  1632          STRAL*LBUF+317D
11606  12 0000  1633  RL32AD   ENTAL*0
11607  02 4022  1634          CMAL*T194D
11610  61 3022  1635          JPEQ*TEMPR
11611  02 4023  1636          CMAL*T195D
11612  61 3022  1637          JPEQ*TEMPR
11613  02 4024  1640          CMAL*T196D
11614  61 3022  1641          JPEQ*TEMPR
11615  12 0416  1642          ENTAL*GEM2E-3
11616  44 1403  1643          STRAL*LBUF+196D
11617  12 0417  1644          ENTAL*GEM2E-2
11620  44 1402  1645          STRAL*LBUF+195D
11621  12 0420  1646          ENTAL*GEM2E-1
11622  44 1401  1647          STRAL*LBUF+194D
11623  12 0407  1650  L32R     ENTAL*GEM2E-12
11624  44 1761  1651          STRAL*LBUF+434D
11625  12 0406  1652          ENTAL*GEM2E-13
11626  44 1252  1653          STRAL*LBUF+107D
11627  12 0405  1654          ENTAL*GEM2E-14
11630  44 1771  1655          STRAL*LBUF+442D
11631  34 1145  1656          JP*L16D
11632  00 0000  1657          0*0
11633  00 0000  1660          0*0
11634  12 4116  1661  L33      ENTAL*TEMP+4
11635  61 0214  1662          JPALZ*L1
11636  12 4112  1663          ENTAL*TEMP
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11501  12 0401  1526          ENTAL*GEM2E-20
11502  44 1557  1527          STRAL*LBUF+304D
11503  12 0400  1530          ENTAL*GEM2E-21
11504  44 1165  1531          STRAL*LBUF+54D
11505  12 0000  1532  RL28AD  ENTAL*0
11506  02 4017  1533          CMAL*T178D
11507  61 3022  1534          JPEQ*TEMPR
11510  02 4020  1535          CMAL*T179D
11511  61 3022  1536          JPEQ*TEMPR
11512  02 4021  1537          CMAL*T180D
11513  61 3022  1540          JPEQ*TEMPR
11514  12 0416  1541          ENTAL*GEM2E-3
11515  44 1363  1542          STRAL*LBUF+180D
11516  12 0417  1543          ENTAL*GEM2E-2
11517  44 1362  1544          STRAL*LBUF+179D
11520  12 0420  1545          ENTAL*GEM2E-1
11521  44 1361  1546          STRAL*LBUF+178D
11522  12 0414  1547          ENTAL*GEM2E-5
11523  34 0251  1550          JP*MAP+1
11524  00 0000  1551          0*0
11525  00 0000  1552          0*0
11526  12 4116  1553  L29     ENTAL*TEMP+4
11527  61 1537  1554          JPALZ*L29D1
11530  12 4112  1555          ENTAL*TEMP
11531  44 1361  1556          STRAL*LBUF+178D
11532  12 4113  1557          ENTAL*TEMP+1
11533  44 1362  1560          STRAL*LBUF+179D
11534  12 4114  1561          ENTAL*TEMP+2
11535  44 1363  1562          STRAL*LBUF+180D
11536  40 4116  1563  L29D    CL*TEMP+4
11537  12 0307  1564  L29D1   ENTAL*GEM1E-12
11540  44 1240  1565          STRAL*LBUF+97D
11541  12 0306  1566          ENTAL*GEM1E-13
11542  44 1740  1567          STRAL*LBUF+417D
11543  12 0305  1570          ENTAL*GEM1E-14
11544  44 1426  1571          STRAL*LBUF+215D
11545  34 0764  1572          JP*L13D
11546  00 0000  1573          0*0
11547  00 0000  1574          0*0
11550  12 0407  1575  L30     ENTAL*GEM2E-12
11551  44 1241  1576          STRAL*LBUF+98D
11552  12 0406  1577          ENTAL*GEM2E-13
11553  44 1734  1600          STRAL*LBUF+413D
11554  12 0405  1601          ENTAL*GEM2E-14
11555  44 1374  1602          STRAL*LBUF+189D
11556  12 0402  1603          ENTAL*GEM2E-17
11557  44 1624  1604          STRAL*LBUF+341D
```

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11637  44 1401  1664          STRAL*LBUF+194D
11640  12 4113  1665          ENTAL*TEMP+1
11641  44 1402  1666          STRAL*LBUF+195D
11642  12 4114  1667          ENTAL*TEMP+2
11643  44 1403  1670          STRAL*LBUF+196D
11644  40 4116  1671          CL*TEMP+4
11645  34 0214  1672          JP*L1
11646  00 0000  1673          0*0
11647  00 0000  1674          0*0
11650  12 0407  1675  L36      ENTAL*GEM2E-12
11651  44 1151  1676          STRAL*LBUF+42D
11652  12 0406  1677          ENTAL*GEM2E-13
11653  44 1132  1700          STRAL*LBUF+27D
11654  12 0405  1701          ENTAL*GEM2E-14
11655  44 1427  1702          STRAL*LBUF+216D
11656  12 0402  1703          ENTAL*GEM2E-17
11657  44 1705  1704          STRAL*LBUF+390D
11660  12 0401  1705          ENTAL*GEM2E-20
11661  44 1562  1706          STRAL*LBUF+307D
11662  12 0400  1707          ENTAL*GEM2E-21
11663  44 1703  1710          STRAL*LBUF+388D
11664  12 0000  1711  RL36AD   ENTAL*0
11665  02 4025  1712          CMAL*T203D
11666  61 3022  1713          JPEQ*TEMPR
11667  02 4026  1714          CMAL*T204D
11670  61 3022  1715          JPEQ*TEMPR
11671  02 4027  1716          CMAL*T205D
11672  61 3022  1717          JPEQ*TEMPR
11673  12 0416  1720          ENTAL*GEM2E-3
11674  44 1414  1721          STRAL*LBUF+205D
11675  12 0417  1722          ENTAL*GEM2E-2
11676  44 1413  1723          STRAL*LBUF+204D
11677  12 0420  1724          ENTAL*GEM2E-1
11700  44 1412  1725          STRAL*LBUF+203D
11701  12 0414  1726          ENTAL*GEM2E-5
11702  34 0251  1727          JP*MAP+1
11703  00 0000  1730          0*0
11704  00 0000  1731          0*0
11705  12 4116  1732  L37      ENTAL*TEMP+4
11706  61 0541  1733          JPALZ*L5D1
11707  12 4112  1734          ENTAL*TEMP
11710  44 1412  1735          STRAL*LBUF+203D
11711  12 4113  1736          ENTAL*TEMP+1
11712  44 1413  1737          STRAL*LBUF+204D
11713  12 4114  1740          ENTAL*TEMP+2
11714  44 1414  1741          STRAL*LBUF+205D
11715  34 0540  1742          JP*L5D
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11716  00 0000  1743            0*0
11717  00 0000  1744            0*0
11720  12 0407  1745  L40       ENTAL*GEM2E-12
11721  44 1377  1746            STRAL*LBUF+192D
11722  12 0406  1747            ENTAL*GEM2E-13
11723  44 1162  1750            STRAL*LBUF+51D
11724  12 0405  1751            ENTAL*GEM2E-14
11725  44 1430  1752            STRAL*LBUF+217D
11726  12 0402  1753            ENTAL*GEM2E-17
11727  44 1706  1754            STRAL*LBUF+391D
11730  12 0401  1755            ENTAL*GEM2E-20
11731  44 1564  1756            STRAL*LBUF+309D
11732  12 0400  1757            ENTAL*GEM2E-21
11733  44 1166  1760            STRAL*LBUF+55D
11734  12 0000  1761  RL40AD    ENTAL*0
11735  02 4030  1762            CMAL*T219D
11736  61 3022  1763            JPEQ*TEMPR
11737  02 4031  1764            CMAL*T220D
11740  61 3022  1765            JPEQ*TEMPR
11741  02 4032  1766            CMAL*T221D
11742  61 3022  1767            JPEQ*TEMPR
11743  12 0416  1770            ENTAL*GEM2E-3
11744  44 1434  1771            STRAL*LBUF+221D
11745  12 0417  1772            ENTAL*GEM2E-2
11746  44 1433  1773            STRAL*LBUF+220D
11747  12 0420  1774            ENTAL*GEM2E-1
11750  44 1432  1775            STRAL*LBUF+219D
11751  12 0414  1776            ENTAL*GEM2E-5
11752  34 0251  1777            JP*MAP+1
11753  00 0000  2000            0*0
11754  00 0000  2001            0*0
11755  12 4116  2002  L41       ENTAL*TEMP+4
11756  61 0674  2003            JPALZ*L9D1
11757  12 4112  2004            ENTAL*TEMP
11760  44 1432  2005            STRAL*LBUF+219D
11761  12 4113  2006            ENTAL*TEMP+1
11762  44 1433  2007            STRAL*LBUF+220D
11763  12 4114  2010            ENTAL*TEMP+2
11764  44 1434  2011            STRAL*LBUF+221D
11765  34 0672  2012            JP*L9D
11766  00 0000  2013            0*0
11767  00 0000  2014            0*0
11770  12 0407  2015  L44       ENTAL*GEM2E-12
11771  44 1200  2016            STRAL*LBUF+65D
11772  12 0406  2017            ENTAL*GEM2E-13
11773  44 1340  2020            STRAL*LBUF+161D
11774  12 0405  2021            ENTAL*GEM2E-14
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11775   44 1435   2022            STRAL*LBUF+222D
11776   12 0402   2023            ENTAL*GEM2E-17
11777   44 1714   2024            STRAL*LBUF+397D
12000   12 0401   2025            ENTAL*GEM2E-20
12001   44 1566   2026            STRAL*LBUF+311D
12002   12 0400   2027            ENTAL*GEM2E-21
12003   44 1601   2030            STRAL*LBUF+322D
12004   12 0000   2031    RL44AD  ENTAL*0
12005   02 4033   2032            CMAL*T228D
12006   61 3022   2033            JPEQ*TEMPR
12007   02 4034   2034            CMAL*T229D
12010   61 3022   2035            JPEQ*TEMPR
12011   02 4035   2036            CMAL*T230D
12012   61 3022   2037            JPEQ*TEMPR
12013   12 0416   2040            ENTAL*GEM2E-3
12014   44 1445   2041            STRAL*LBUF+230D
12015   12 0417   2042            ENTAL*GEM2E-2
12016   44 1444   2043            STRAL*LBUF+229D
12017   12 0420   2044            ENTAL*GEM2E-1
12020   44 1443   2045            STRAL*LBUF+228D
12021   12 0414   2046            ENTAL*GEM2E-5
12022   34 0251   2047            JP*MAP+1
12023   00 0000   2050            0*0
12024   00 0000   2051            0*0
12025   12 4116   2052    L45     ENTAL*TEMP+4
12026   61 0756   2053            JPALZ*L13
12027   12 4112   2054            ENTAL*TEMP
12030   44 1443   2055            STRAL*LBUF+228D
12031   12 4113   2056            ENTAL*TEMP+1
12032   44 1444   2057            STRAL*LBUF+229D
12033   12 4114   2060            ENTAL*TEMP+2
12034   44 1445   2061            STRAL*LBUF+230D
12035   40 4116   2062            CL*TEMP+4
12036   34 0756   2063            JP*L13
12037   00 0000   2064            0*0
12040   00 0000   2065            0*0
12041   12 0402   2066    L48     ENTAL*GEM2E-17
12042   44 1762   2067            STRAL*LBUF+435D
12043   12 0401   2070            ENTAL*GEM2E-20
12044   44 1143   2071            STRAL*LBUF+36D
12045   12 0400   2072            ENTAL*GEM2E-21
12046   44 1731   2073            STRAL*LBUF+410D
12047   12 0000   2074    RL48AD  ENTAL*0
12050   02 4036   2075            CMAL*T244D
12051   61 3022   2076            JPEQ*TEMPR
12052   02 4037   2077            CMAL*T245D
12053   61 3022   2100            JPEQ*TEMPR
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12054  02 4040  2101          CMAL*T246D
12055  61 3022  2102          JPEQ*TEMPR
12056  12 0416  2103          ENTAL*GEM2E-3
12057  44 1465  2104          STRAL*LBUF+246D
12060  12 0417  2105          ENTAL*GEM2E-2
12061  44 1464  2106          STRAL*LBUF+245D
12062  12 0420  2107          ENTAL*GEM2E-1
12063  44 1463  2110          STRAL*LBUF+244D
12064  34 1137  2111          JP*L16R
12065  00 0000  2112          0*0
12066  00 0000  2113          0*0
12067  12 4116  2114  L49      ENTAL*TEMP+4
12070  61 1207  2115          JPALZ*L17D1
12071  12 4112  2116          ENTAL*TEMP
12072  44 1463  2117          STRAL*LBUF+244D
12073  12 4113  2120          ENTAL*TEMP+1
12074  44 1464  2121          STRAL*LBUF+245D
12075  12 4114  2122          ENTAL*TEMP+2
12076  44 1465  2123          STRAL*LBUF+246D
12077  34 1206  2124          JP*L17D
12100  00 0000  2125          0*0
12101  00 0000  2126          0*0
12102  12 0407  2127  L52      ENTAL*GEM2E-12
12103  44 1214  2130          STRAL*LBUF+77D
12104  12 0406  2131          ENTAL*GEM2E-13
12105  44 1367  2132          STRAL*LBUF+184D
12106  12 0405  2133          ENTAL*GEM2E-14
12107  44 1441  2134          STRAL*LBUF+226D
12110  12 0402  2135          ENTAL*GEM2E-17
12111  44 1776  2136          STRAL*LBUF+447D
12112  12 0401  2137          ENTAL*GEM2E-20
12113  44 1145  2140          STRAL*LBUF+38D
12114  12 0400  2141          ENTAL*GEM2E-21
12115  44 1172  2142          STRAL*LBUF+59D
12116  12 0000  2143  RL52AD   ENTAL*0
12117  02 4044  2144          CMAL*T353D
12120  61 3022  2145          JPEQ*TEMPR
12121  02 4045  2146          CMAL*T354D
12122  61 3022  2147          JPEQ*TEMPR
12123  02 4046  2150          CMAL*T355D
12124  61 3022  2151          JPEQ*TEMPR
12125  12 0416  2152          ENTAL*GEM2E-3
12126  44 1642  2153          STRAL*LBUF+355D
12127  12 0417  2154          ENTAL*GEM2E-2
12130  44 1641  2155          STRAL*LBUF+354D
12131  12 0420  2156          ENTAL*GEM2E-1
12132  44 1640  2157          STRAL*LBUF+353D
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12133  12 0414  2160          ENTAL*GEM2E-5
12134  34 0251  2161          JP*MAP+1
12135  00 0000  2162          0*0
12136  00 0000  2163          0*0
12137  12 4116  2164    L53   ENTAL*TEMP+4
12140  61 1317  2165          JPALZ*L21D1
12141  12 4112  2166          ENTAL*TEMP
12142  44 1640  2167          STRAL*LBUF+353D
12143  12 4113  2170          ENTAL*TEMP+1
12144  44 1641  2171          STRAL*LBUF+354D
12145  12 4114  2172          ENTAL*TEMP+2
12146  44 1642  2173          STRAL*LBUF+355D
12147  34 1316  2174          JP*L21D
12150  00 0000  2175          0*0
12151  00 0000  2176          0*0
12152  12 0407  2177    L56   ENTAL*GEM2E-12
12153  44 1230  2200          STRAL*LBUF+89D
12154  12 0406  2201          ENTAL*GEM2E-13
12155  44 1344  2202          STRAL*LBUF+165D
12156  12 0405  2203          ENTAL*GEM2E-14
12157  44 1244  2204          STRAL*LBUF+101D
12160  12 0402  2205          ENTAL*GEM2E-17
12161  44 1777  2206          STRAL*LBUF+448D
12162  12 0401  2207          ENTAL*GEM2E-20
12163  44 1526  2210          STRAL*LBUF+279D
12164  12 0400  2211          ENTAL*GEM2E-21
12165  44 1174  2212          STRAL*LBUF+61D
12166  12 0000  2213  RL56AD  ENTAL*0
12167  02 4047  2214          CMAL*T369D
12170  61 3022  2215          JPEQ*TEMPR
12171  02 4050  2216          CMAL*T370D
12172  61 3022  2217          JPEQ*TEMPR
12173  02 4051  2220          CMAL*T371D
12174  61 3022  2221          JPEQ*TEMPR
12175  12 0416  2222          ENTAL*GEM2E-3
12176  44 1662  2223          STRAL*LBUF+371D
12177  12 0417  2224          ENTAL*GEM2E-2
12200  44 1661  2225          STRAL*LBUF+370D
12201  12 0420  2226          ENTAL*GEM2E-1
12202  44 1660  2227          STRAL*LBUF+369D
12203  12 0414  2230          ENTAL*GEM2E-5
12204  34 0251  2231          JP*MAP+1
12205  00 0000  2232          0*0
12206  00 0000  2233          0*0
12207  12 4116  2234    L57   ENTAL*TEMP+4
12210  61 1427  2235          JPALZ*L25D1
12211  12 4112  2236          ENTAL*TEMP
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12212  44 1660  2237            STRAL*LBUF+369D
12213  12 4113  2240            ENTAL*TEMP+1
12214  44 1661  2241            STRAL*LBUF+370D
12215  12 4114  2242            ENTAL*TEMP+2
12216  44 1662  2243            STRAL*LBUF+371D
12217  34 1426  2244            JP*L25D
12220  00 0000  2245            0*0
12221  00 0000  2246            0*0
12222  12 0407  2247  L60       ENTAL*GEM2E-12
12223  44 1313  2250            STRAL*LBUF+140D
12224  12 0406  2251            ENTAL*GEM2E-13
12225  44 1345  2252            STRAL*LBUF+166D
12226  12 0405  2253            ENTAL*GEM2E-14
12227  44 1767  2254            STRAL*LBUF+440D
12230  12 0402  2255            ENTAL*GEM2E-17
12231  44 2001  2256            STRAL*LBUF+450D
12232  12 0401  2257            ENTAL*GEM2E-20
12233  44 1527  2260            STRAL*LBUF+280D
12234  12 0400  2261            ENTAL*GEM2E-21
12235  44 1523  2262            STRAL*LBUF+276D
12236  12 0000  2263  RL60AD    ENTAL*0
12237  02 4052  2264            CMAL*T378D
12240  61 3022  2265            JPEQ*TEMPR
12241  02 4053  2266            CMAL*T379D
12242  61 3022  2267            JPEQ*TEMPR
12243  02 4054  2270            CMAL*T380D
12244  61 3022  2271            JPEQ*TEMPR
12245  12 0416  2272            ENTAL*GEM2E-3
12246  44 1673  2273            STRAL*LBUF+380D
12247  12 0417  2274            ENTAL*GEM2E-2
12250  44 1672  2275            STRAL*LBUF+379D
12251  12 0420  2276            ENTAL*GEM2E-1
12252  44 1671  2277            STRAL*LBUF+378D
12253  12 0414  2300            ENTAL*GEM2E-5
12254  34 0251  2301            JP*MAP+1
12255  00 0000  2302            0*0
12256  00 0000  2303            0*0
12257  12 4116  2304  L61       ENTAL*TEMP+4
12260  61 1537  2305            JPALZ*L29D1
12261  12 4112  2306            ENTAL*TEMP
12262  44 1671  2307            STRAL*LBUF+378D
12263  12 4113  2310            ENTAL*TEMP+1
12264  44 1672  2311            STRAL*LBUF+379D
12265  12 4114  2312            ENTAL*TEMP+2
12266  44 1673  2313            STRAL*LBUF+380D
12267  34 1536  2314            JP*L29D
12270  00 0000  2315            0*0
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12271  00 0000  2316          0*0
12272  12 0402  2317  L64     ENTAL*GEM2E-17
12273  44 2002  2320          STRAL*LBUF+451D
12274  12 0401  2321          ENTAL*GEM2E-20
12275  44 1533  2322          STRAL*LBUF+284D
12276  12 0400  2323          ENTAL*GEM2E-21
12277  44 1524  2324          STRAL*LBUF+277D
12300  12 0000  2325  RL64AD  ENTAL*0
12301  02 4055  2326          CMAL*T394D
12302  61 3022  2327          JPEQ*TEMPR
12303  02 4056  2330          CMAL*T395D
12304  61 3022  2331          JPEQ*TEMPR
12305  02 4057  2332          CMAL*T396D
12306  61 3022  2333          JPEQ*TEMPR
12307  12 0416  2334          ENTAL*GEM2E-3
12310  44 1713  2335          STRAL*LBUF+396D
12311  12 0417  2336          ENTAL*GEM2E-2
12312  44 1712  2337          STRAL*LBUF+395D
12313  12 0420  2340          ENTAL*GEM2E-1
12314  44 1711  2341          STRAL*LBUF+394D
12315  34 1623  2342          JP*L32R
12316  00 0000  2343          0*0
12317  00 0000  2344          0*0
12320  12 4116  2345  L65     ENTAL*TEMP+4
12321  61 0214  2346          JPALZ*L1
12322  12 4112  2347          ENTAL*TEMP
12323  44 1711  2350          STRAL*LBUF+394D
12324  12 4113  2351          ENTAL*TEMP+1
12325  44 1712  2352          STRAL*LBUF+395D
12326  12 4114  2353          ENTAL*TEMP+2
12327  44 1713  2354          STRAL*LBUF+396D
12330  40 4116  2355          CL*TEMP+4
12331  34 0214  2356          JP*L1
12332  00 0000  2357          0*0
12333  00 0000  2360          0*0
12334  12 0407  2361  L68     ENTAL*GEM2E-12
12335  44 1151  2362          STRAL*LBUF+42D
12336  12 0406  2363          ENTAL*GEM2E-13
12337  44 1132  2364          STRAL*LBUF+27D
12340  12 0405  2365          ENTAL*GEM2E-14
12341  44 1427  2366          STRAL*LBUF+216D
12342  12 0402  2367          ENTAL*GEM2E-17
12343  44 2003  2370          STRAL*LBUF+452D
12344  12 0401  2371          ENTAL*GEM2E-20
12345  44 1535  2372          STRAL*LBUF+286D
12346  12 0400  2373          ENTAL*GEM2E-21
12347  44 1525  2374          STRAL*LBUF+278D
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12350  12 0000  2375    RL68AD  ENTAL*0
12351  02 4060  2376            CMAL*T403D
12352  61 3022  2377            JPEQ*TEMPR
12353  02 4061  2400            CMAL*T404D
12354  61 3022  2401            JPEQ*TEMPR
12355  02 4062  2402            CMAL*T405D
12356  61 3022  2403            JPEQ*TEMPR
12357  12 0416  2404            ENTAL*GEM2E-3
12360  44 1724  2405            STRAL*LBUF+405D
12361  12 0417  2406            ENTAL*GEM2E-2
12362  44 1723  2407            STRAL*LBUF+404D
12363  12 0420  2410            ENTAL*GEM2E-1
12364  44 1722  2411            STRAL*LBUF+403D
12365  12 0414  2412            ENTAL*GEM2E-5
12366  34 0251  2413            JP*MAP+1
12367  00 0000  2414            0*0
12370  00 0000  2415            0*0
12371  12 4116  2416    L69     ENTAL*TEMP+4
12372  61 0541  2417            JPALZ*L5D1
12373  12 4112  2420            ENTAL*TEMP
12374  44 1722  2421            STRAL*LBUF+403D
12375  12 4113  2422            ENTAL*TEMP+1
12376  44 1723  2423            STRAL*LBUF+404D
12377  12 4114  2424            ENTAL*TEMP+2
12400  44 1724  2425            STRAL*LBUF+405D
12401  34 0540  2426            JP*L5D
12402  00 0000  2427            0*0
12403  00 0000  2430            0*0
12404  12 0407  2431    L72     ENTAL*GEM2E-12
12405  44 1377  2432            STRAL*LBUF+192D
12406  12 0406  2433            ENTAL*GEM2E-13
12407  44 1162  2434            STRAL*LBUF+51D
12410  12 0405  2435            ENTAL*GEM2E-14
12411  44 1430  2436            STRAL*LBUF+217D
12412  12 0402  2437            ENTAL*GEM2E-17
12413  44 2012  2440            STRAL*LBUF+459D
12414  12 0401  2441            ENTAL*GEM2E-20
12415  44 1556  2442            STRAL*LBUF+303D
12416  12 0400  2443            ENTAL*GEM2E-21
12417  44 1543  2444            STRAL*LBUF+292D
12420  12 0000  2445    RL72AD  ENTAL*0
12421  02 4063  2446            CMAL*T419D
12422  61 3022  2447            JPEQ*TEMPR
12423  02 4064  2450            CMAL*T420D
12424  61 3022  2451            JPEQ*TEMPR
12425  02 4065  2452            CMAL*T421D
12426  61 3022  2453            JPEQ*TEMPR
```

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12427  12 0416  2454          ENTAL*GEM2E-3
12430  44 1744  2455          STRAL*LBUF+421D
12431  12 0417  2456          ENTAL*GEM2E-2
12432  44 1743  2457          STRAL*LBUF+420D
12433  12 0420  2460          ENTAL*GEM2E-1
12434  44 1742  2461          STRAL*LBUF+419D
12435  12 0414  2462          ENTAL*GEM2E-5
12436  34 0251  2463          JP*MAP+1
12437  00 0000  2464          0*0
12440  00 0000  2465          0*0
12441  12 4116  2466    L73   ENTAL*TEMP+4
12442  61 0674  2467          JPALZ*L9D1
12443  12 4112  2470          ENTAL*TEMP
12444  44 1742  2471          STRAL*LBUF+419D
12445  12 4113  2472          ENTAL*TEMP+1
12446  44 1743  2473          STRAL*LBUF+420D
12447  12 4114  2474          ENTAL*TEMP+2
12450  44 1744  2475          STRAL*LBUF+421D
12451  34 0672  2476          JP*L9D
12452  00 0000  2477          0*0
12453  00 0000  2500          0*0
12454  12 0407  2501    L76   ENTAL*GEM2E-12
12455  44 1200  2502          STRAL*LBUF+65D
12456  12 0406  2503          ENTAL*GEM2E-13
12457  44 1340  2504          STRAL*LBUF+161D
12460  12 0405  2505          ENTAL*GEM2E-14
12461  44 1435  2506          STRAL*LBUF+222D
12462  12 0402  2507          ENTAL*GEM2E-17
12463  44 2013  2510          STRAL*LBUF+460D
12464  12 0401  2511          ENTAL*GEM2E-20
12465  44 1555  2512          STRAL*LBUF+302D
12466  12 0400  2513          ENTAL*GEM2E-21
12467  44 1545  2514          STRAL*LBUF+294D
12470  12 0000  2515  RL76AD  ENTAL*0
12471  02 4066  2516          CMAL*T428D
12472  61 3022  2517          JPEQ*TEMPR
12473  02 4067  2520          CMAL*T429D
12474  61 3022  2521          JPEQ*TEMPR
12475  02 4070  2522          CMAL*T430D
12476  61 3022  2523          JPEQ*TEMPR
12477  12 0416  2524          ENTAL*GEM2E-3
12500  44 1755  2525          STRAL*LBUF+430D
12501  12 0417  2526          ENTAL*GEM2E-2
12502  44 1754  2527          STRAL*LBUF+429D
12503  12 0420  2530          ENTAL*GEM2E-1
12504  44 1753  2531          STRAL*LBUF+428D
12505  12 0414  2532          ENTAL*GEM2E-5
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12506  34 0251  2533          JP*MAP+1
12507  00 0000  2534          0*0
12510  00 0000  2535          0*0
12511  12 4116  2536  L77     ENTAL*TEMP+4
12512  61 0756  2537          JPALZ*L13
12513  12 4112  2540          ENTAL*TEMP
12514  44 1753  2541          STRAL*LBUF+428D
12515  12 4113  2542          ENTAL*TEMP+1
12516  44 1754  2543          STRAL*LBUF+429D
12517  12 4114  2544          ENTAL*TEMP+2
12520  44 1755  2545          STRAL*LBUF+430D
12521  40 4116  2546          CL*TEMP+4
12522  34 0756  2547          JP*L13
12523  00 0000  2550          0*0
12524  00 0000  2551          0*0
12525  12 0402  2552  L80     ENTAL*GEM2E-17
12526  44 2016  2553          STRAL*LBUF+463D
12527  12 0401  2554          ENTAL*GEM2E-20
12530  44 2014  2555          STRAL*LBUF+461D
12531  12 0400  2556          ENTAL*GEM2E-21
12532  44 1554  2557          STRAL*LBUF+301D
12533  12 0000  2560  RL80AD  ENTAL*0
12534  02 4071  2561          CMAL*T444D
12535  61 3022  2562          JPEQ*TEMPR
12536  02 4072  2563          CMAL*T445D
12537  61 3022  2564          JPEQ*TEMPR
12540  02 4073  2565          CMAL*T446D
12541  61 3022  2566          JPEQ*TEMPR
12542  12 0416  2567          ENTAL*GEM2E-3
12543  44 1775  2570          STRAL*LBUF+446D
12544  12 0417  2571          ENTAL*GEM2E-2
12545  44 1774  2572          STRAL*LBUF+445D
12546  12 0420  2573          ENTAL*GEM2E-1
12547  44 1773  2574          STRAL*LBUF+444D
12550  34 1137  2575          JP*L16R
12551  00 0000  2576          0*0
12552  00 0000  2577          0*0
12553  12 4116  2600  L81     ENTAL*TEMP+4
12554  61 1207  2601          JPALZ*L17D1
12555  12 4112  2602          ENTAL*TEMP
12556  44 1773  2603          STRAL*LBUF+444D
12557  12 4113  2604          ENTAL*TEMP+1
12560  44 1774  2605          STRAL*LBUF+445D
12561  12 4114  2606          ENTAL*TEMP+2
12562  44 1775  2607          STRAL*LBUF+446D
12563  34 1206  2610          JP*L17D
12564  00 0000  2611          0*0
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12565  00 0000  2612          0*0
12566  12 0407  2613  L84     ENTAL*GEM2E-12
12567  44 1214  2614          STRAL*LBUF+77D
12570  12 0406  2615          ENTAL*GEM2E-13
12571  44 1367  2616          STRAL*LBUF+184D
12572  12 0405  2617          ENTAL*GEM2E-14
12573  44 1441  2620          STRAL*LBUF+226D
12574  12 0402  2621          ENTAL*GEM2E-17
12575  44 2020  2622          STRAL*LBUF+465D
12576  12 0401  2623          ENTAL*GEM2E-20
12577  44 2017  2624          STRAL*LBUF+464D
12600  12 0400  2625          ENTAL*GEM2E-21
12601  44 1546  2626          STRAL*LBUF+295D
12602  12 0000  2627  RL84AD  ENTAL*0
12603  02 4074  2630          CMAL*T453D
12604  61 3022  2631          JPEQ*TEMPR
12605  02 4075  2632          CMAL*T454D
12606  61 3022  2633          JPEQ*TEMPR
12607  02 4076  2634          CMAL*T455D
12610  61 3022  2635          JPEQ*TEMPR
12611  12 0416  2636          ENTAL*GEM2E-3
12612  44 2006  2637          STRAL*LBUF+455D
12613  12 0417  2640          ENTAL*GEM2E-2
12614  44 2005  2641          STRAL*LBUF+454D
12615  12 0420  2642          ENTAL*GEM2E-1
12616  44 2004  2643          STRAL*LBUF+453D
12617  12 0414  2644          ENTAL*GEM2E-5
12620  34 0251  2645          JP*MAP+1
12621  00 0000  2646          0*0
12622  00 0000  2647          0*0
12623  12 4116  2650  L85     ENTAL*TEMP+4
12624  61 1317  2651          JPALZ*L21D1
12625  12 4112  2652          ENTAL*TEMP
12626  44 2004  2653          STRAL*LBUF+453D
12627  12 4113  2654          ENTAL*TEMP+1
12630  44 2005  2655          STRAL*LBUF+454D
12631  12 4114  2656          ENTAL*TEMP+2
12632  44 2006  2657          STRAL*LBUF+455D
12633  34 1316  2660          JP*L21D
12634  00 0000  2661          0*0
12635  00 0000  2662          0*0
12636  12 0407  2663  L88     ENTAL*GEM2E-12
12637  44 1230  2664          STRAL*LBUF+89D
12640  12 0406  2665          ENTAL*GEM2E-13
12641  44 1344  2666          STRAL*LBUF+165D
12642  12 0405  2667          ENTAL*GEM2E-14
12643  44 1244  2670          STRAL*LBUF+101D
```

```
12644  12 0402  2671          ENTAL*GEM2E-17
12645  44 2021  2672          STRAL*LBUF+456D
12646  12 0401  2673          ENTAL*GEM2E-20
12647  44 1133  2674          STRAL*LBUF+28D
12650  12 0400  2675          ENTAL*GEM2E-21
12651  44 1572  2676          STRAL*LBUF+315D
12652  12 0000  2677  RL88AD  ENTAL*0
12653  02 4077  2700          CMAL*T469D
12654  61 3022  2701          JPEQ*TEMPR
12655  02 4100  2702          CMAL*T470D
12656  61 3022  2703          JPEQ*TEMPR
12657  02 4101  2704          CMAL*T471D
12660  61 3022  2705          JPEQ*TEMPR
12661  12 0416  2706          ENTAL*GEM2E-3
12662  44 2026  2707          STRAL*LBUF+471D
12663  12 0417  2710          ENTAL*GEM2E-2
12664  44 2025  2711          STRAL*LBUF+470D
12665  12 0420  2712          ENTAL*GEM2E-1
12666  44 2024  2713          STRAL*LBUF+469D
12667  12 0414  2714          ENTAL*GEM2E-5
12670  34 0251  2715          JP*MAP+1
12671  00 0000  2716          0*0
12672  00 0000  2717          0*0
12673  12 4116  2720  L89     ENTAL*TEMP+4
12674  61 1427  2721          JPALZ*L25D1
12675  12 4112  2722          ENTAL*TEMP
12676  44 2024  2723          STRAL*LBUF+469D
12677  12 4113  2724          ENTAL*TEMP+1
12700  44 2025  2725          STRAL*LBUF+470D
12701  12 4114  2726          ENTAL*TEMP+2
12702  44 2026  2727          STRAL*LBUF+471D
12703  34 1426  2730          JP*L25D
12704  00 0000  2731          0*0
12705  00 0000  2732          0*0
12706  12 0407  2733  L92     ENTAL*GEM2E-12
12707  44 1313  2734          STRAL*LBUF+140D
12710  12 0406  2735          ENTAL*GEM2E-13
12711  44 1345  2736          STRAL*LBUF+166D
12712  12 0405  2737          ENTAL*GEM2E-14
12713  44 1767  2740          STRAL*LBUF+440D
12714  12 0402  2741          ENTAL*GEM2E-17
12715  44 2022  2742          STRAL*LBUF+467D
12716  12 0401  2743          ENTAL*GEM2E-20
12717  44 1170  2744          STRAL*LBUF+57D
12720  12 0400  2745          ENTAL*GEM2E-21
12721  44 1547  2746          STRAL*LBUF+296D
12722  12 0000  2747  RL92AD  ENTAL*0
```

```
12723  02 4102  2750            CMAL*T478D
12724  61 3022  2751            JPEQ*TEMPR
12725  02 4103  2752            CMAL*T479D
12726  61 3022  2753            JPEQ*TEMPR
12727  02 4104  2754            CMAL*T480D
12730  61 3022  2755            JPEQ*TEMPR
12731  12 0416  2756            ENTAL*GEM2E-3
12732  44 2037  2757            STRAL*LBUF+480D
12733  12 0417  2760            ENTAL*GEM2E-2
12734  44 2036  2761            STRAL*LBUF+479D
12735  12 0420  2762            ENTAL*GEM2E-1
12736  44 2035  2763            STRAL*LBUF+478D
12737  12 0414  2764            ENTAL*GEM2E-5
12740  34 0251  2765            JP*MAP+1
12741  00 0000  2766            0*0
12742  00 0000  2767            0*0
12743  12 4116  2770    L93     ENTAL*TEMP+4
12744  61 1537  2771            JPALZ*L29D1
12745  12 4112  2772            ENTAL*TEMP
12746  44 2035  2773            STRAL*LBUF+478D
12747  12 4113  2774            ENTAL*TEMP+1
12750  44 2036  2775            STRAL*LBUF+479D
12751  12 4114  2776            ENTAL*TEMP+2
12752  44 2037  2777            STRAL*LBUF+480D
12753  34 1536  3000            JP*L29D
12754  00 0000  3001            0*0
12755  00 0000  3002            0*0
12756  12 0402  3003    L96     ENTAL*GEM2E-17
12757  44 2032  3004            STRAL*LBUF+475D
12760  12 0401  3005            ENTAL*GEM2E-20
12761  44 2027  3006            STRAL*LBUF+472D
12762  12 0400  3007            ENTAL*GEM2E-21
12763  44 1164  3010            STRAL*LBUF+53D
12764  12 0000  3011    RL96AD  ENTAL*0
12765  02 4105  3012            CMAL*T494D
12766  61 3022  3013            JPEQ*TEMPR
12767  02 4106  3014            CMAL*T495D
12770  61 3022  3015            JPEQ*TEMPR
12771  02 4107  3016            CMAL*T496D
12772  61 3022  3017            JPEQ*TEMPR
12773  12 0416  3020            ENTAL*GEM2E-3
12774  44 2057  3021            STRAL*LBUF+496D
12775  12 0417  3022            ENTAL*GEM2E-2
12776  44 2056  3023            STRAL*LBUF+495D
12777  12 0420  3024            ENTAL*GEM2E-1
13000  44 2055  3025            STRAL*LBUF+494D
13001  34 1623  3026            JP*L32R
```

```
13002  00 0000  3027          0*0
13003  00 0000  3030          0*0
13004  12 4116  3031  L97     ENTAL*TEMP+4
13005  61 0214  3032          JPALZ*L1
13006  12 4112  3033          ENTAL*TEMP
13007  44 2055  3034          STRAL*LBUF+494D
13010  12 4113  3035          ENTAL*TEMP+1
13011  44 2056  3036          STRAL*LBUF+495D
13012  12 4114  3037          ENTAL*TEMP+2
13013  44 2057  3040          STRAL*LBUF+496D
13014  40 4116  3041          CL*TEMP+4
13015  34 0214  3042          JP*L1
13016  00 0000  3043          0*0
13017  00 0000  3044          0*0
13020  12 4120  3045  TEMPR8  ENTAL*BIGBEN
13021  44 4115  3046          STRAL*TEMP+3
13022  12 0416  3047  TEMPR    ENTAL*GEM2E-3
13023  44 4114  3050          STRAL*TEMP+2
13024  12 0417  3051          ENTAL*GEM2E-2
13025  44 4113  3052          STRAL*TEMP+1
13026  12 0420  3053          ENTAL*GEM2E-1
13027  44 4112  3054          STRAL*TEMP
13030  70 0001  3055          ENTALK*01
13031  44 4116  3056          STRAL*TEMP+4
13032  50 3000  3057          RIL*0
13033  70 0020  3060          ENTALK*16D
13034  02 4136  3061          CMAL*XCOUNT
13035  61 1137  3062          JPEQ*L16R
13036  70 0040  3063          ENTALK*32D
13037  02 4136  3064          CMAL*XCOUNT
13040  61 1623  3065          JPEQ*L32R
13041  70 0060  3066          ENTALK*48D
13042  02 4136  3067          CMAL*XCOUNT
13043  61 1137  3070          JPEQ*L16R
13044  70 0100  3071          ENTALK*64D
13045  02 4136  3072          CMAL*XCOUNT
13046  61 1623  3073          JPEQ*L32R
13047  70 0120  3074          ENTALK*80D
13050  02 4136  3075          CMAL*XCOUNT
13051  61 1137  3076          JPEQ*L16R
13052  70 0140  3077          ENTALK*96D
13053  02 4136  3100          CMAL*XCOUNT
13054  61 1623  3101          JPEQ*L32R
13055  12 0414  3102          ENTAL*GEM2E-5
13056  34 0251  3103          JP*MAP+1
13057  00 0000  3104          0*0
13060  00 0000  3105          0*0
```

```
13061    0000 00    3106                0*0
13062    0000 00    3107                0*0


MEM. STRG. USED  2271
20000  THRU  22270
                   0                   PROG*WENTZ*19MARCH1965
88
20000   00 0000   1        LISTGD     0*0
20001   50 7207   2                   ENTICR*7                  SELECT B BOX 7
20002   50 7310   3                   ENTSR*10                  SET SR ACTIVE TO BANK 0
20003   12 4110   4                   ENTAL*FILMAP              PICK UP FLAG
20004   61 0037   5                   JPALZ*DLIST2              IF DATA IS GOOD
20005   40 4110   6                   CL*FILMAP
20006   12 4111   7                   ENTAL*BUFCR
20007   74 0114   10                  STRADR*DL1AD
20010   74 0241   11                  STRADR*DL2AD
20011   74 0424   12                  STRADR*DL4AD
20012   74 0645   13                  STRADR*DL5AD
20013   74 0744   14                  STRADR*DL6AD
20014   74 1044   15                  STRADR*DL7AD
20015   74 1143   16                  STRADR*DL8AD
20016   74 1242   17                  STRADR*DL9AD
20017   74 1303   20                  STRADR*DL10AD
20020   74 1344   21                  STRADR*DL11AD
20021   74 1405   22                  STRADR*DL12AD
20022   74 1446   23                  STRADR*DL13AD
20023   74 1507   24                  STRADR*DL14AD
20024   74 1550   25                  STRADR*DL15AD
20025   74 1611   26                  STRADR*DL16AD
20026   74 1652   27                  STRADR*DL17AD
20027   74 1713   30                  STRADR*DL18AD
20030   74 1754   31                  STRADR*DL19AD
20031   74 2015   32                  STRADR*DL20AD
20032   74 2056   33                  STRADR*DL21AD
20033   74 2117   34                  STRADR*DL22AD
20034   74 2160   35                  STRADR*DL23AD
20035   74 2221   36                  STRADR*DL24AD
20036   55 0000   37                  IJP*LISTGD
20037   32 4136   40        DLIST2    ENTB*XCOUNT               AND PICK UP FRAME COUNT.
20040   50 7312   41                  ENTSR*12                  SET SR ACTIVE TO BANK 2
20041   13 0044   42                  ENTALB*DLIST3-1           PICK UP ADDRESS TO HANDLE THIS FRAME
20042   74 0044   43                  STRADR*LOK+2
20043   50 7310   44                  ENTSR*10
20044   34 0000   45                  JP*0                      ADDRESS SET BY PREVIOUS INSTRUCTION.
20045   02 0075   46        DLIST3    0*DL1
20046   02 0222   47                  0*DL2
```

```
20047  02 0333  50              0*DL3
20050  02 0416  51              0*DL4
20051  02 0626  52              0*DL5
20052  02 0725  53              0*DL6
20053  02 1025  54              0*DL7
20054  02 1124  55              0*DL8
20055  02 1223  56              0*DL9
20056  02 1264  57              0*DL10
20057  02 1325  60              0*DL11
20060  02 1366  61              0*DL12
20061  02 1427  62              0*DL13
20062  02 1470  63              0*DL14
20063  02 1531  64              0*DL15
20064  02 1572  65              0*DL16
20065  02 1633  66              0*DL17
20066  02 1674  67              0*DL18
20067  02 1735  70              0*DL19
20070  02 1776  71              0*DL20
20071  02 2037  72              0*DL21
20072  02 2100  73              0*DL22
20073  02 2141  74              0*DL23
20074  02 2202  75              0*DL24
20075  12 4112  76      DL1     ENTAL*TEMP
20076  61 0106  77              JPALZ*DL1NT
20077  12 4113  100             ENTAL*TEMP+1
20100  44 2055  101             STRAL*LBUF+494D
20101  12 4114  102             ENTAL*TEMP+2
20102  44 2056  103             STRAL*LBUF+495D
20103  12 4115  104             ENTAL*TEMP+3
20104  44 2057  105             STRAL*LBUF+496D
20105  40 4112  106             CL*TEMP
20106  12 0357  107     DL1NT   ENTAL*GEM1E-15
20107  44 1625  110             STRAL*LBUF+342D
20110  12 0356  111             ENTAL*GEM1E-16
20111  44 1551  112             STRAL*LBUF+298D
20112  12 0355  113             ENTAL*GEM1E-17
20113  44 1553  114             STRAL*LBUF+300D
20114  12 0000  115     DL1AD   ENTAL*0
20115  02 4003  116             CMAL*T103D
20116  61 0123  117             JPEQ*LOK+5
20117  02 4004  120             CMAL*T104D
20120  61 0123  121             JPEQ*LOK+3
20121  02 4005  122             CMAL*T105D
20122  63 0125  123             JPNOT*LOK+3
20123  76 2243  124             RJP*TEMPR1
20124  34 0133  125             JP*LOK+7
20125  12 0373  126             ENTAL*GEM1E-01
```

```
20126  44 1246  127          STRAL*LBUF+103D
20127  12 0372  130          ENTAL*GEM1E-02
20130  44 1247  131          STRAL*LBUF+104D
20131  12 0371  132          ENTAL*GEM1E-03
20132  44 1250  133          STRAL*LBUF+105D
20133  12 0363  134    L15   ENTAL*GEM1E-11
20134  44 1151  135          STRAL*LBUF+042D
20135  12 0362  136          ENTAL*GEM1E-12
20136  44 1132  137          STRAL*LBUF+027D
20137  12 0361  140          ENTAL*GEM1E-13
20140  44 1427  141          STRAL*LBUF+216D
20141  12 0343  142          ENTAL*GEM1E-31
20142  44 1421  143          STRAL*LBUF+210D
20143  12 0342  144          ENTAL*GEM1E-32
20144  44 1736  145          STRAL*LBUF+415D
20145  12 0341  146          ENTAL*GEM1E-33
20146  44 1746  147          STRAL*LBUF+423D
20147  12 0323  150          ENTAL*GEM1E-51
20150  44 1422  151          STRAL*LBUF+211D
20151  12 0322  152          ENTAL*GEM1E-52
20152  44 1327  153          STRAL*LBUF+152D
20153  12 0321  154          ENTAL*GEM1E-53
20154  44 1757  155          STRAL*LBUF+432D
20155  12 0317  156          ENTAL*GEM1E-55
20156  44 1605  157          STRAL*LBUF+326D
20157  12 0316  160          ENTAL*GEM1E-56
20160  44 1751  161          STRAL*LBUF+426D
20161  12 0315  162          ENTAL*GEM1E-57
20162  44 1763  163          STRAL*LBUF+436D
20163  12 0303  164          ENTAL*GEM1E-71
20164  44 1424  165          STRAL*LBUF+213D
20165  12 0302  166          ENTAL*GEM1E-72
20166  44 1131  167          STRAL*LBUF+026D
20167  12 0301  170          ENTAL*GEM1E-73
20170  44 1275  171          STRAL*LBUF+126D
20171  12 0307  172    AA01  ENTAL*GEM1E-65
20172  44 1107  173          STRAL*LBUF+008D
20173  44 1140  174          STRAL*LBUF+033D
20174  44 1171  175          STRAL*LBUF+058D
20175  44 1222  176          STRAL*LBUF+083D
20176  44 1253  177          STRAL*LBUF+108D
20177  44 1304  200          STRAL*LBUF+133D
20200  44 1335  201          STRAL*LBUF+158D
20201  44 1366  202          STRAL*LBUF+183D
20202  44 1417  203          STRAL*LBUF+208D
20203  44 1450  204          STRAL*LBUF+233D
20204  44 1501  205          STRAL*LBUF+258D
```

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20205  44 1532  205          STRAL*LBUF+283D
20206  44 1563  207          STRAL*LBUF+308D
20207  44 1614  210          STRAL*LBUF+333D
20210  44 1645  211          STRAL*LBUF+358D
20211  44 1676  212          STRAL*LBUF+383D
20212  44 1727  213          STRAL*LBUF+408D
20213  44 1760  214          STRAL*LBUF+433D
20214  44 2011  215          STRAL*LBUF+458D
20215  44 2042  216          STRAL*LBUF+483D
20216  44 1250  217          STRAL*LBUF+105D                UPDATE SET
20217  55 0000  220          IJP*LISTGD
20220  00 0000  221          0*0
20221  00 0000  222          0*0
20222  12 4112  223     DL2  ENTAL*TEMP
20223  61 0233  224          JPALZ*DL2NT
20224  12 4113  225          ENTAL*TEMP+1
20225  44 1246  226          STRAL*LBUF+103D
20226  12 4114  227          ENTAL*TEMP+2
20227  44 1247  230          STRAL*LBUF+104D
20230  12 4115  231          ENTAL*TEMP+3
20231  44 1250  232          STRAL*LBUF+105D
20232  40 4112  233          CL*TEMP
20233  12 0457  234   DL2NT  ENTAL*GEM2E-15
20234  44 1632  235          STRAL*LBUF+347D
20235  12 0456  236          ENTAL*GEM2E-16
20236  44 1134  237          STRAL*LBUF+029D
20237  12 0455  240          ENTAL*GEM2E-17
20240  44 1573  241          STRAL*LBUF+316D
20241  12 0000  242   DL2AD  ENTAL*0
20242  02 4000  243          CMAL*T69D
20243  61 0256  244          JPEQ*LOK+13
20244  02 4041  245          CMAL*T319D
20245  61 0256  246          JPEQ*LOK+11
20246  02 4001  247          CMAL*T70D
20247  61 0256  250          JPEQ*LOK+7
20250  02 4042  251          CMAL*T320D
20251  61 0256  252          JPEQ*LOK+5
20252  02 4002  253          CMAL*T71D
20253  61 0256  254          JPEQ*LOK+3
20254  02 4043  255          CMAL*T321D
20255  63 0260  256          JPNOT*LOK+3
20256  76 2256  257          RJP*TEMPR2
20257  34 0271  260          JP*L2S
20260  12 0473  261          ENTAL*GEM2E-01
20261  44 1204  262          STRAL*LBUF+069D
20262  44 1576  263          STRAL*LBUF+319D
20263  12 0472  264          ENTAL*GEM2E-02
```

```
20264   44 1205   265            STRAL*LBUF+070D
20265   44 1577   266            STRAL*LBUF+320D
20266   12 0471   267            ENTAL*GEM2E-03
20267   44 1206   270            STRAL*LBUF+071D
20270   44 1600   271            STRAL*LBUF+321D
20271   12 0463   272     L2S    ENTAL*GEM2E-11
20272   44 1377   273            STRAL*LBUF+192D
20273   12 0462   274            ENTAL*GEM2E-12
20274   44 1162   275            STRAL*LBUF+051D
20275   12 0461   276            ENTAL*GEM2E-13
20276   44 1430   277            STRAL*LBUF+217D
20277   12 0443   300            ENTAL*GEM2E-31
20300   44 1161   301            STRAL*LBUF+050D
20301   12 0442   302            ENTAL*GEM2E-32
20302   44 1737   303            STRAL*LBUF+416D
20303   12 0441   304            ENTAL*GEM2E-33
20304   44 1405   305            STRAL*LBUF+198D
20305   12 0423   306            ENTAL*GEM2E-51
20306   44 1652   307            STRAL*LBUF+363D
20307   12 0422   310            ENTAL*GEM2E-52
20310   44 1334   311            STRAL*LBUF+157D
20311   12 0421   312            ENTAL*GEM2E-53
20312   44 1263   313            STRAL*LBUF+116D
20313   12 0417   314            ENTAL*GEM2E-55
20314   44 1606   315            STRAL*LBUF+327D
20315   12 0416   316            ENTAL*GEM2E-56
20316   44 1323   317            STRAL*LBUF+148D
20317   12 0415   320            ENTAL*GEM2E-57
20320   44 1245   321            STRAL*LBUF+102D
20321   12 0403   322            ENTAL*GEM2E-71
20322   44 1157   323            STRAL*LBUF+048D
20323   12 0402   324            ENTAL*GEM2E-72
20324   44 1274   325            STRAL*LBUF+125D
20325   12 0401   326            ENTAL*GEM2E-73
20326   44 1303   327            STRAL*LBUF+132D
20327   12 0407   330            ENTAL*GEM2E-65
20330   34 0172   331            JP*AA01+1
20331   00 0000   332            0*0
20332   00 0000   333            0*0
20333   12 4112   334     DL3    ENTAL*TEMP
20334   61 0347   335            JPALZ*DL3NT
20335   12 4113   336            ENTAL*TEMP+1
20336   44 1204   337            STRAL*LBUF+069D
20337   44 1576   340            STRAL*LBUF+319D
20340   12 4114   341            ENTAL*TEMP+2
20341   44 1205   342            STRAL*LBUF+070D
20342   44 1577   343            STRAL*LBUF+320D
```

```
20343  12 4115  344                ENTAL*TEMP+3
20344  44 1206  345                STRAL*LBUF+071D
20345  44 1600  346                STRAL*LBUF+321D
20346  40 4112  347                CL*TEMP
20347  12 0357  350      DL3NT     ENTAL*GEM1E-15
20350  44 1633  351                STRAL*LBUF+348D
20351  12 0356  352                ENTAL*GEM1E-16
20352  44 1135  353                STRAL*LBUF+030D
20353  12 0355  354                ENTAL*GEM1E-17
20354  44 1154  355                STRAL*LBUF+045D
20355  12 0363  356      L3S       ENTAL*GEM1E-11
20356  44 1200  357                STRAL*LBUF+065D
20357  12 0362  360                ENTAL*GEM1E-12
20360  44 1340  361                STRAL*LBUF+161D
20361  12 0361  362                ENTAL*GEM1E-13
20362  44 1435  363                STRAL*LBUF+222D
20363  12 0343  364                ENTAL*GEM1E-31
20364  44 1346  365                STRAL*LBUF+167D
20365  12 0342  366                ENTAL*GEM1E-32
20366  44 1745  367                STRAL*LBUF+422D
20367  12 0341  370                ENTAL*GEM1E-33
20370  44 1407  371                STRAL*LBUF+200D
20371  12 0323  372                ENTAL*GEM1E-51
20372  44 1654  373                STRAL*LBUF+365D
20373  12 0322  374                ENTAL*GEM1E-52
20374  44 1636  375                STRAL*LBUF+351D
20375  12 0321  376                ENTAL*GEM1E-53
20376  44 1264  377                STRAL*LBUF+117D
20377  12 0317  400                ENTAL*GEM1E-55
20400  44 1613  401                STRAL*LBUF+332D
20401  12 0316  402                ENTAL*GEM1E-56
20402  44 1325  403                STRAL*LBUF+150D
20403  12 0315  404                ENTAL*GEM1E-57
20404  44 1666  405                STRAL*LBUF+375D
20405  12 0303  406                ENTAL*GEM1E-71
20406  44 1272  407                STRAL*LBUF+123D
20407  12 0302  410                ENTAL*GEM1E-72
20410  44 1163  411                STRAL*LBUF+052D
20411  12 0301  412                ENTAL*GEM1E-73
20412  44 1305  413                STRAL*LBUF+134D
20413  34 0171  414                JP*+A01
20414  00 0000  415                0*0
20415  00 0000  416                0*0
20416  12 0457  417      DL4       ENTAL*GEM2E-15
20417  44 1635  420                STRAL*LBUF+350D
20420  12 0456  421                ENTAL*GEM2E-16
20421  44 1141  422                STRAL*LBUF+034D
```

```
20422  12 0455  423              ENTAL*GEM2E-17
20423  44 1647  424              STRAL*LBUF+360D
20424  12 0000  425      DL4AD   ENTAL*0
20425  02 4006  426              CMAL*T144D
20426  61 0433  427              JPEQ*LOK+5
20427  02 4007  430              CMAL*T145D
20430  61 0433  431              JPEQ*LOK+3
20431  02 4010  432              CMAL*T146D
20432  63 0435  433              JPNOT*LOK+3
20433  76 2256  434              RJP*TEMPR2
20434  34 0443  435              JP*LOK+7
20435  12 0473  436              ENTAL*GEM2E-01
20436  44 1317  437              STRAL*LBUF+144D
20437  12 0472  440              ENTAL*GEM2E-02
20440  44 1320  441              STRAL*LBUF+145D
20441  12 0471  442              ENTAL*GEM2E-03
20442  44 1321  443              STRAL*LBUF+146D
20443  12 0463  444      L4S     ENTAL*GEM2E-11
20444  44 1202  445              STRAL*LBUF+067D
20445  12 0462  446              ENTAL*GEM2E-12
20446  44 1342  447              STRAL*LBUF+163D
20447  12 0461  450              ENTAL*GEM2E-13
20450  44 1440  451              STRAL*LBUF+225D
20451  12 0443  452              ENTAL*GEM2E-31
20452  44 1353  453              STRAL*LBUF+172D
20453  12 0442  454              ENTAL*GEM2E-32
20454  44 1765  455              STRAL*LBUF+438D
20455  12 0441  456              ENTAL*GEM2E-33
20456  44 1410  457              STRAL*LBUF+201D
20457  12 0423  460              ENTAL*GEM2E-51
20460  44 1655  461              STRAL*LBUF+366D
20461  12 0422  462              ENTAL*GEM2E-52
20462  44 1637  463              STRAL*LBUF+352D
20463  12 0421  464              ENTAL*GEM2E-53
20464  44 1271  465              STRAL*LBUF+122D
20465  12 0417  466              ENTAL*GEM2E-55
20466  44 1615  467              STRAL*LBUF+334D
20467  12 0416  470              ENTAL*GEM2E-56
20470  44 1656  471              STRAL*LBUF+367D
20471  12 0415  472              ENTAL*GEM2E-57
20472  44 1663  473              STRAL*LBUF+372D
20473  12 0403  474              ENTAL*GEM2E-71
20474  44 1201  475              STRAL*LBUF+066D
20475  12 0402  476              ENTAL*GEM2E-72
20476  44 1360  477              STRAL*LBUF+177D
20477  12 0401  500              ENTAL*GEM2E-73
20500  44 1314  501              STRAL*LBUF+141D
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20506   44 1735  507              STRAL*LBUF+414D
20507   12 0467  510              ENTAL*GEM2E-5
20510   44 1312  511              STRAL*LBUF+139D
20511   44 1704  512              STRAL*LBUF+389D
20512   12 0466  513              ENTAL*GEM2E-6
20513   44 1461  514              STRAL*LBUF+242D
20514   44 2053  515              STRAL*LBUF+492D
20515   12 0465  516              ENTAL*GEM2E-7
20516   44 1224  517              STRAL*LBUF+85D
20517   44 1616  520              STRAL*LBUF+335D
20520   12 0464  521              ENTAL*GEM2E-10
20521   44 1146  522              STRAL*LBUF+39D
20522   44 1540  523              STRAL*LBUF+289D
20523   12 0460  524              ENTAL*GEM2E-14
20524   44 1115  525              STRAL*LBUF+14D
20525   44 1507  526              STRAL*LBUF+264D
20526   12 0453  527              ENTAL*GEM2E-21
20527   44 1456  530              STRAL*LBUF+239D
20530   44 2050  531              STRAL*LBUF+489D
20531   12 0452  532              ENTAL*GEM2E-22
20532   44 1436  533              STRAL*LBUF+223D
20501   12 0474  502      DLLST   ENTAL*GEM2E
20502   44 1177  503              STRAL*LBUF+64D
20503   44 1571  504              STRAL*LBUF+314D
20504   12 0470  505              ENTAL*GEM2E-4
20505   44 1343  506              STRAL*LBUF+164D
20533   44 2030  534              STRAL*LBUF+473D
20534   12 0451  535              ENTAL*GEM2E-23
20535   44 1416  536              STRAL*LBUF+207D
20536   44 2010  537              STRAL*LBUF+457D
20537   12 0450  540              ENTAL*GEM2E-24
20540   44 1261  541              STRAL*LBUF+114D
20541   44 1653  542              STRAL*LBUF+364D
20542   12 0447  543              ENTAL*GEM2E-25
20543   44 1376  544              STRAL*LBUF+191D
20544   44 1770  545              STRAL*LBUF+441D
20545   12 0446  546              ENTAL*GEM2E-26
20546   44 1356  547              STRAL*LBUF+175D
20547   44 1750  550              STRAL*LBUF+425D
20550   12 0445  551              ENTAL*GEM2E-27
20551   44 1336  552              STRAL*LBUF+159D
20552   44 1730  553              STRAL*LBUF+409D
20553   12 0437  554              ENTAL*GEM2E-35
20554   44 1315  555              STRAL*LBUF+142D
20555   44 1707  556              STRAL*LBUF+392D
20556   12 0436  557              ENTAL*GEM2E-36
20557   44 1276  560              STRAL*LBUF+127D
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20560  44 1670  561          STRAL*LBUF+377D
20561  12 0435  562          ENTAL*GEM2E-37
20562  44 1256  563          STRAL*LBUF+111D
20563  44 1650  564          STRAL*LBUF+361D
20564  12 0433  565          ENTAL*GEM2E-41
20565  44 1236  566          STRAL*LBUF+95D
20566  44 1630  567          STRAL*LBUF+345D
20567  12 0432  570          ENTAL*GEM2E-42
20570  44 1216  571          STRAL*LBUF+79D
20571  44 1610  572          STRAL*LBUF+329D
20572  12 0431  573          ENTAL*GEM2E-43
20573  44 1176  574          STRAL*LBUF+63D
20574  44 1570  575          STRAL*LBUF+313D
20575  12 0426  576          ENTAL*GEM2E-46
20576  44 1466  577          STRAL*LBUF+247D
20577  44 2060  600          STRAL*LBUF+497D
20600  12 0425  601          ENTAL*GEM2E-47
20601  44 1173  602          STRAL*LBUF+60D
20602  44 1565  603          STRAL*LBUF+310D
20603  12 0413  604          ENTAL*GEM2E-61
20604  44 1156  605          STRAL*LBUF+47D
20605  44 1550  606          STRAL*LBUF+297D
20606  12 0412  607          ENTAL*GEM2E-62
20607  44 1137  610          STRAL*LBUF+32D
20610  44 1531  611          STRAL*LBUF+282D
20611  12 0411  612          ENTAL*GEM2E-63
20612  44 1116  613          STRAL*LBUF+15D
20613  44 1510  614          STRAL*LBUF+265D
20614  12 0406  615          ENTAL*GEM2E-66
20615  44 1142  616          STRAL*LBUF+35D
20616  44 1534  617          STRAL*LBUF+285D
20617  12 0405  620          ENTAL*GEM2E-67
20620  44 1111  621          STRAL*LBUF+10D
20621  44 1503  622          STRAL*LBUF+260D
20622  12 0407  623          ENTAL*GEM2E-65
20623  34 0172  624          JP*AA01+1
20624  00 0000  625          0*0
20625  00 0000  626          0*0
20626  12 4112  627    DL5   ENTAL*TEMP
20627  61 0637  630          JPALZ*DL5NT
20630  12 4113  631          ENTAL*TEMP+1
20631  44 1317  632          STRAL*LBUF+144D
20632  12 4114  633          ENTAL*TEMP+2
20633  44 1320  634          STRAL*LBUF+145D
20634  12 4115  635          ENTAL*TEMP+3
20635  44 1321  636          STRAL*LBUF+146D
20636  40 4112  637          CL*TEMP
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20637  12 0357  640      DL5NT   ENTAL*GEM1E-15
20640  44 1667  641              STRAL*LBUF+376D
20641  12 0356  642              ENTAL*GEM1E-16
20642  44 1147  643              STRAL*LBUF+040D
20643  12 0355  644              ENTAL*GEM1E-17
20644  44 1664  645              STRAL*LBUF+373D
20645  12 0000  646      DL5AD   ENTAL*0
20646  02 4011  647              CMAL*T153D
20647  61 0654  650              JPEQ*LOK+5
20650  02 4012  651              CMAL*T154D
20651  61 0654  652              JPEQ*LOK+3
20652  02 4013  653              CMAL*T155D
20653  63 0656  654              JPNOT*LOK+3
20654  76 2243  655              RJP*TEMPR1
20655  34 0664  656              JP*LOK+7
20656  12 0373  657              ENTAL*GEM1E-01
20657  44 1330  660              STRAL*LBUF+153D
20660  12 0372  661              ENTAL*GEM1E-02
20661  44 1331  662              STRAL*LBUF+154D
20662  12 0371  663              ENTAL*GEM1E-03
20663  44 1332  664              STRAL*LBUF+155D
20664  12 0363  665      L5S     ENTAL*GEM1E-11
20665  44 1214  666              STRAL*LBUF+077D
20666  12 0362  667              ENTAL*GEM1E-12
20667  44 1367  670              STRAL*LBUF+184D
20670  12 0361  671              ENTAL*GEM1E-13
20671  44 1441  672              STRAL*LBUF+226D
20672  12 0343  673              ENTAL*GEM1E-31
20673  44 1213  674              STRAL*LBUF+076D
20674  12 0342  675              ENTAL*GEM1E-32
20675  44 1212  676              STRAL*LBUF+075D
20676  12 0341  677              ENTAL*GEM1E-33
20677  44 1411  700              STRAL*LBUF+202D
20700  12 0323  701              ENTAL*GEM1E-51
20701  44 1210  702              STRAL*LBUF+073D
20702  12 0322  703              ENTAL*GEM1E-52
20703  44 1721  704              STRAL*LBUF+402D
20704  12 0321  705              ENTAL*GEM1E-53
20705  44 1371  706              STRAL*LBUF+186D
20706  12 0317  707              ENTAL*GEM1E-55
20707  44 1617  710              STRAL*LBUF+336D
20710  12 0316  711              ENTAL*GEM1E-56
20711  44 1311  712              STRAL*LBUF+138D
20712  12 0315  713              ENTAL*GEM1E-57
20713  44 1715  714              STRAL*LBUF+398D
20714  12 0303  715              ENTAL*GEM1E-71
20715  44 1207  716              STRAL*LBUF+072D
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20716  12 0302  717          ENTAL*GEM1E-72
20717  44 1365  720          STRAL*LBUF+182D
20720  12 0301  721          ENTAL*GEM1E-73
20721  44 1322  722          STRAL*LBUF+147D
20722  34 0171  723          JP*AA01
20723  00 0000  724          0*0
20724  00 0000  725          0*0
20725  12 4112  726    DL6   ENTAL*TEMP
20726  61 0736  727          JPALZ*DL6NT
20727  12 4113  730          ENTAL*TEMP+1
20730  44 1330  731          STRAL*LBUF+153D
20731  12 4114  732          ENTAL*TEMP+2
20732  44 1331  733          STRAL*LBUF+154D
20733  12 4115  734          ENTAL*TEMP+3
20734  44 1332  735          STRAL*LBUF+155D
20735  40 4112  736          CL*TEMP
20736  12 0457  737    DL6NT ENTAL*GEM2E-15
20737  44 1677  740          STRAL*LBUF+384D
20740  12 0456  741          ENTAL*GEM2E-16
20741  44 1150  742          STRAL*LBUF+041D
20742  12 0455  743          ENTAL*GEM2E-17
20743  44 1675  744          STRAL*LBUF+382D
20744  12 0000  745    DL6AD ENTAL*0
20745  02 4014  746          CMAL*T169D
20746  61 0753  747          JPEQ*L0K+5
20747  02 4015  750          CMAL*T170D
20750  61 0753  751          JPEQ*L0K+3
20751  02 4016  752          CMAL*T171D
20752  63 0755  753          JPNOT*L0K+3
20753  76 2256  754          RJP*TEMPR2
20754  34 0763  755          JP*L0K+7
20755  12 0473  756          ENTAL*GEM2E-01
20756  44 1350  757          STRAL*LBUF+169D
20757  12 0472  760          ENTAL*GEM2E-02
20760  44 1351  761          STRAL*LBUF+170D
20761  12 0471  762          ENTAL*GEM2E-03
20762  44 1352  763          STRAL*LBUF+171D
20763  12 0463  764    L6S   ENTAL*GEM2E-11
20764  44 1230  765          STRAL*LBUF+89D
20765  12 0462  766          ENTAL*GEM2E12
20766  44 1344  767          STRAL*LBUF+165D
20767  12 0461  770          ENTAL*GEM2E-13
20770  44 1244  771          STRAL*LBUF+101D
20771  12 0443  772          ENTAL*GEM2E-31
20772  44 1227  773          STRAL*LBUF+68D
20773  12 0442  774          ENTAL*GEM2E-32
20774  44 1225  775          STRAL*LBUF+86D
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20775  12 0441  776          ENTAL*GEM2E-33
20776  44 1404  777          STRAL*LBUF+197D
20777  12 0423  1000         ENTAL*GEM2E-51
21000  44 1646  1001         STRAL*LBUF+359D
21001  12 0422  1002         ENTAL*GEM2E-52
21002  44 1726  1003         STRAL*LBUF+407D
21003  12 0421  1004         ENTAL*GEM2E-53
21004  44 1262  1005         STRAL*LBUF+115D
21005  12 0417  1006         ENTAL*GEM2E-55
21006  44 1621  1007         STRAL*LBUF+338D
21007  12 0416  1010         ENTAL*GEM2E-56
21010  44 1307  1011         STRAL*LBUF+136D
21011  12 0415  1012         ENTAL*GEM2E-57
21012  44 1644  1013         STRAL*LBUF+357D
21013  12 0403  1014         ENTAL*GEM2E-71
21014  44 1223  1015         STRAL*LBUF+84D
21015  12 0402  1016         ENTAL*GEM2E-72
21016  44 1221  1017         STRAL*LBUF+82D
21017  12 0401  1020         ENTAL*GEM2E-73
21020  44 1326  1021         STRAL*LBUF+151D
21021  12 0407  1022         ENTAL*GEM2E-65
21022  34 0172  1023         JP*AA01+1
21023  00 0000  1024         0*0
21024  00 0000  1025         0*0
21025  12 4112  1026  DL7    ENTAL*TEMP
21026  61 1036  1027         JPALZ*DL7NT
21027  12 4113  1030         ENTAL*TEMP+1
21030  44 1350  1031         STRAL*LBUF+169D
21031  12 4114  1032         ENTAL*TEMP+2
21032  44 1351  1033         STRAL*LBUF+170D
21033  12 4115  1034         ENTAL*TEMP+3
21034  44 1352  1035         STRAL*LBUF+171D
21035  40 4112  1036         CL*TEMP
21036  12 0357  1037  DL7NT   ENTAL*GEM1E-15
21037  44 1700  1040         STRAL*LBUF+385D
21040  12 0356  1041         ENTAL*GEM1E-16
21041  44 1557  1042         STRAL*LBUF+304D
21042  12 0355  1043         ENTAL*GEM1E-17
21043  44 1165  1044         STRAL*LBUF+054D
21044  12 0000  1045  DL7AD  ENTAL*0
21045  02 4017  1046         CMAL*T178D
21046  61 1053  1047         JPEQ*LOK+5
21047  02 4020  1050         CMAL*T179D
21050  61 1053  1051         JPEQ*LOK+3
21051  02 4021  1052         CMAL*T180D
21052  63 1055  1053         JPNOT*LOK+3
21053  76 2243  1054         RJP*TEMPR1
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21054  34 1063  1055          JP*LOK+7
21055  12 0373  1056          ENTAL*GEM1E-01
21056  44 1361  1057          STRAL*LBUF+178D
21057  12 0372  1060          ENTAL*GEM1E-02
21060  44 1362  1061          STRAL*LBUF+179D
21061  12 0371  1062          ENTAL*GEM1E-03
21062  44 1363  1063          STRAL*LBUF+180D
21063  12 0363  1064  L7S     ENTAL*GEM1E-11
21064  44 1313  1065          STRAL*LBUF+140D
21065  12 0362  1066          ENTAL*GEM1E-12
21066  44 1345  1067          STRAL*LBUF+166D
21067  12 0361  1070          ENTAL*GEM1E-13
21070  44 1767  1071          STRAL*LBUF+440D
21071  12 0343  1072          ENTAL*GEM1E-31
21072  44 1354  1073          STRAL*LBUF+173D
21073  12 0342  1074          ENTAL*GEM1E-32
21074  44 1233  1075          STRAL*LBUF+92D
21075  12 0341  1076          ENTAL*GEM1E-33
21076  44 1420  1077          STRAL*LBUF+209D
21077  12 0323  1100          ENTAL*GEM1E-51
21100  44 1232  1101          STRAL*LBUF+91D
21101  12 0322  1102          ENTAL*GEM1E-52
21102  44 1732  1103          STRAL*LBUF+411D
21103  12 0321  1104          ENTAL*GEM1E-53
21104  44 1373  1105          STRAL*LBUF+188D
21105  12 0317  1106          ENTAL*GEM1E-55
21106  44 1623  1107          STRAL*LBUF+340D
21107  12 0316  1110          ENTAL*GEM1E-56
21110  44 1622  1111          STRAL*LBUF+339D
21111  12 0315  1112          ENTAL*GEM1E-57
21112  44 1717  1113          STRAL*LBUF+400D
21113  12 0303  1114          ENTAL*GEM1E-71
21114  44 1375  1115          STRAL*LBUF+190D
21115  12 0302  1116          ENTAL*GEM1E-72
21116  44 1231  1117          STRAL*LBUF+90D
21117  12 0301  1120          ENTAL*GEM1E-73
21120  44 1425  1121          STRAL*LBUF+214D
21121  34 0171  1122          JP*AA01
21122  00 0000  1123          0*0
21123  00 0000  1124          0*0
21124  12 4112  1125  DL8     ENTAL*TEMP
21125  61 1135  1126          JPALZ*DL8NT
21126  12 4113  1127          ENTAL*TEMP+1
21127  44 1361  1130          STRAL*LBUF+178D
21130  12 4114  1131          ENTAL*TEMP+2
21131  44 1362  1132          STRAL*LBUF+179D
21132  12 4115  1133          ENTAL*TEMP+3
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21133  44 1363  1134            STRAL*LBUF+180D
21134  40 4112  1135            CL*TEMP
21135  12 0457  1136     DL8NT  ENTAL*GEM2E-15
21136  44 1701  1137            STRAL*LBUF+386D
21137  12 0456  1140            ENTAL*GEM2E-16
21140  44 1560  1141            STRAL*LBUF+305D
21141  12 0455  1142            ENTAL*GEM2E-17
21142  44 1574  1143            STRAL*LBUF+317D
21143  12 0000  1144     DL8AD  ENTAL*0
21144  02 4022  1145            CMAL*T194D
21145  61 1152  1146            JPEQ*LOK+5
21146  02 4023  1147            CMAL*T195D
21147  61 1152  1150            JPEQ*LOK+3
21150  02 4024  1151            CMAL*T196D
21151  63 1154  1152            JPNOT*LOK+3
21152  76 2256  1153            RJP*TEMPR2
21153  34 1162  1154            JP*LOK+7
21154  12 0473  1155            ENTAL*GEM2E-01
21155  44 1401  1156            STRAL*LBUF+194D
21156  12 0472  1157            ENTAL*GEM2E-02
21157  44 1402  1160            STRAL*LBUF+195D
21160  12 0471  1161            ENTAL*GEM2E-03
21161  44 1403  1162            STRAL*LBUF+196D
21162  12 0463  1163     L8S    ENTAL*GEM2E-11
21163  44 1761  1164            STRAL*LBUF+434D
21164  12 0462  1165            ENTAL*GEM2E-12
21165  44 1252  1166            STRAL*LBUF+107D
21166  12 0461  1167            ENTAL*GEM2E-13
21167  44 1771  1170            STRAL*LBUF+442D
21170  12 0443  1171            ENTAL*GEM2E-31
21171  44 1357  1172            STRAL*LBUF+176D
21172  12 0442  1173            ENTAL*GEM2E-32
21173  44 1243  1174            STRAL*LBUF+100D
21174  12 0441  1175            ENTAL*GEM2E-33
21175  44 1766  1176            STRAL*LBUF+439D
21176  12 0423  1177            ENTAL*GEM2E-51
21177  44 1241  1200            STRAL*LBUF+98D
21200  12 0422  1201            ENTAL*GEM2E-52
21201  44 1734  1202            STRAL*LBUF+413D
21202  12 0421  1203            ENTAL*GEM2E-53
21203  44 1374  1204            STRAL*LBUF+189D
21204  12 0417  1205            ENTAL*GEM2E-55
21205  44 1624  1206            STRAL*LBUF+341D
21206  12 0416  1207            ENTAL*GEM2E-56
21207  44 1752  1210            STRAL*LBUF+427D
21210  12 0415  1211            ENTAL*GEM2E-57
21211  44 1720  1212            STRAL*LBUF+401D
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21212  12 0403  1213          ENTAL*GEM2E-71
21213  44 1240  1214          STRAL*LBUF+97D
21214  12 0402  1215          ENTAL*GEM2E-72
21215  44 1740  1216          STRAL*LBUF+417D
21216  12 0401  1217          ENTAL*GEM2E-73
21217  44 1426  1220          STRAL*LBUF+215D
21220  34 0501  1221          JP*DLLST
21221  00 0000  1222          0*0
21222  00 0000  1223          0*0
21223  12 4112  1224  DL9     ENTAL*TEMP
21224  61 1234  1225          JPALZ*DL9NT
21225  12 4113  1226          ENTAL*TEMP+1
21226  44 1401  1227          STRAL*LBUF+194D
21227  12 4114  1230          ENTAL*TEMP+2
21230  44 1402  1231          STRAL*LBUF+195D
21231  12 4115  1232          ENTAL*TEMP+3
21232  44 1403  1233          STRAL*LBUF+196D
21233  40 4112  1234          CL*TEMP
21234  12 0357  1235  DL9NT    ENTAL*GEM1E-15
21235  44 1705  1236          STRAL*LBUF+390D
21236  12 0356  1237          ENTAL*GEM1E-16
21237  44 1562  1240          STRAL*LBUF+307D
21240  12 0355  1241          ENTAL*GEM1E-17
21241  44 1703  1242          STRAL*LBUF+388D
21242  12 0000  1243  DL9AD   ENTAL*0
21243  02 4025  1244          CMAL*T203D
21244  61 1251  1245          JPEQ*LOK+5
21245  02 4026  1246          CMAL*T204D
21246  61 1251  1247          JPEQ*LOK+3
21247  02 4027  1250          CMAL*T205D
21250  63 1253  1251          JPNOT*LOK+3
21251  76 2243  1252          RJP*TEMPR1
21252  34 1261  1253          JP*LOK+7
21253  12 0373  1254          ENTAL*GEM1E-01
21254  44 1412  1255          STRAL*LBUF+203D
21255  12 0372  1256          ENTAL*GEM1E-02
21256  44 1413  1257          STRAL*LBUF+204D
21257  12 0371  1260          ENTAL*GEM1E-03
21260  44 1414  1261          STRAL*LBUF+205D
21261  34 0133  1262          JP*L1S
21262  00 0000  1263          0*0
21263  00 0000  1264          0*0
21264  12 4112  1265  DL10    ENTAL*TEMP
21265  61 1275  1266          JPALZ*DL10NT
21266  12 4113  1267          ENTAL*TEMP+1
21267  44 1412  1270          STRAL*LBUF+203D
21270  12 4114  1271          ENTAL*TEMP+2
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21271  44 1413  1272          STRAL*LBUF+204D
21272  12 4115  1273          ENTAL*TEMP+3
21273  44 1414  1274          STRAL*LBUF+205D
21274  40 4112  1275          CL*TEMP
21275  12 0457  1276  DL10NT  ENTAL*GEM2E-15
21276  44 1706  1277          STRAL*LBUF+391D
21277  12 0456  1300          ENTAL*GEM2E-16
21300  44 1564  1301          STRAL*LBUF+309D
21301  12 0455  1302          ENTAL*GEM2E-17
21302  44 1166  1303          STRAL*LBUF+055D
21303  12 0000  1304  DL10AD  ENTAL*0
21304  02 4030  1305          CMAL*T219D
21305  61 1312  1306          JPEQ*L0K+5
21306  02 4031  1307          CMAL*T220D
21307  61 1312  1310          JPEQ*L0K+3
21310  02 4032  1311          CMAL*T221D
21311  63 1314  1312          JPNOT*L0K+3
21312  76 2256  1313          RJP*TEMPR2
21313  34 1322  1314          JP*L0K+7
21314  12 0473  1315          ENTAL*GEM2E-01
21315  44 1432  1316          STRAL*LBUF+219D
21316  12 0472  1317          ENTAL*GEM2E-02
21317  44 1433  1320          STRAL*LBUF+220D
21320  12 0471  1321          ENTAL*GEM2E-03
21321  44 1434  1322          STRAL*LBUF+221D
21322  34 0271  1323          JP*L2S
21323  00 0000  1324          0*0
21324  00 0000  1325          0*0
21325  12 4112  1326  DL11    ENTAL*TEMP
21326  61 1336  1327          JPALZ*DL11NT
21327  12 4113  1330          ENTAL*TEMP+1
21330  44 1432  1331          STRAL*LBUF+219D
21331  12 4114  1332          ENTAL*TEMP+2
21332  44 1433  1333          STRAL*LBUF+220D
21333  12 4115  1334          ENTAL*TEMP+3
21334  44 1434  1335          STRAL*LBUF+221D
21335  40 4112  1336          CL*TEMP
21336  12 0357  1337  DL11NT  ENTAL*GEM1E-15
21337  44 1714  1340          STRAL*LBUF+397D
21340  12 0356  1341          ENTAL*GEM1E-16
21341  44 1566  1342          STRAL*LBUF+311D
21342  12 0355  1343          ENTAL*GEM1E-17
21343  44 1601  1344          STRAL*LBUF+322D
21344  12 0000  1345  DL11AD  ENTAL*0
21345  02 4033  1346          CMAL*T228D
21346  61 1353  1347          JPEQ*L0K+5
21347  02 4034  1350          CMAL*T229D
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21350  61 1353  1351            JPEQ*LOK+3
21351  02 4035  1352            CMAL*T230D
21352  63 1355  1353            JPNOT*LOK+3
21353  76 2243  1354            RJP*TEMPR1
21354  34 1363  1355            JP*LOK+7
21355  12 0373  1356            ENTAL*GEM1E-01
21356  44 1443  1357            STRAL*LBUF+228D
21357  12 0372  1360            ENTAL*GEM1E-02
21360  44 1444  1361            STRAL*LBUF+229D
21361  12 0371  1362            ENTAL*GEM1E-03
21362  44 1445  1363            STRAL*LBUF+230D
21363  34 0355  1364            JP*L3S
21364  00 0000  1365            0*0
21365  00 0000  1366            0*0
21366  12 4112  1367  DL12      ENTAL*TEMP
21367  61 1377  1370            JPALZ*DL12NT
21370  12 4113  1371            ENTAL*TEMP+1
21371  44 1443  1372            STRAL*LBUF+228D
21372  12 4114  1373            ENTAL*TEMP+2
21373  44 1444  1374            STRAL*LBUF+229D
21374  12 4115  1375            ENTAL*TEMP+3
21375  44 1445  1376            STRAL*LBUF+230D
21376  40 4112  1377            CL*TEMP
21377  12 0457  1400  DL12NT    ENTAL*GEM2E-15
21400  44 1762  1401            STRAL*LBUF+435D
21401  12 0456  1402            ENTAL*GEM2E-16
21402  44 1143  1403            STRAL*LBUF+036D
21403  12 0455  1404            ENTAL*GEM2E-17
21404  44 1731  1405            STRAL*LBUF+410D
21405  12 0000  1406  DL12AD    ENTAL*0
21406  02 4036  1407            CMAL*T244D
21407  61 1414  1410            JPEQ*LOK+5
21410  02 4037  1411            CMAL*T245D
21411  61 1414  1412            JPEQ*LOK+3
21412  02 4040  1413            CMAL*T246D
21413  63 1416  1414            JPNOT*LOK+3
21414  76 2256  1415            RJP*TEMPR2
21415  34 1424  1416            JP*LOK+7
21416  12 0473  1417            ENTAL*GEM2E-01
21417  44 1463  1420            STRAL*LBUF+244D
21420  12 0472  1421            ENTAL*GEM2E-02
21421  44 1464  1422            STRAL*LBUF+245D
21422  12 0471  1423            ENTAL*GEM2E-03
21423  44 1465  1424            STRAL*LBUF+246D
21424  34 0443  1425            JP*L4S
21425  00 0000  1426            0*0
21426  00 0000  1427            0*0
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21427  12 4112  1430    DL13    ENTAL*TEMP
21430  61 1440  1431            JPALZ*DL13NT
21431  12 4113  1432            ENTAL*TEMP+1
21432  44 1463  1433            STRAL*LBUF+244D
21433  12 4114  1434            ENTAL*TEMP+2
21434  44 1464  1435            STRAL*LBUF+245D
21435  12 4115  1436            ENTAL*TEMP+3
21436  44 1465  1437            STRAL*LBUF+246D
21437  40 4112  1440            CL*TEMP
21440  12 0357  1441    DL13NT  ENTAL*GEM1E-15
21441  44 1776  1442            STRAL*LBUF+447D
21442  12 0356  1443            ENTAL*GEM1E-16
21443  44 1145  1444            STRAL*LBUF+038D
21444  12 0355  1445            ENTAL*GEM1E-17
21445  44 1172  1446            STRAL*LBUF+059D
21446  12 0000  1447    DL13AD  ENTAL*0
21447  02 4044  1450            CMAL*T353D
21450  61 1455  1451            JPEQ*LOK+5
21451  02 4045  1452            CMAL*T354D
21452  61 1455  1453            JPEQ*LOK+3
21453  02 4046  1454            CMAL*T355D
21454  63 1457  1455            JPNOT*LOK+3
21455  76 2243  1456            RJP*TEMPR1
21456  34 1465  1457            JP*LOK+7
21457  12 0373  1460            ENTAL*GEM1E-01
21460  44 1640  1461            STRAL*LBUF+353D
21461  12 0372  1462            ENTAL*GEM1E-02
21462  44 1641  1463            STRAL*LBUF+354D
21463  12 0371  1464            ENTAL*GEM1E-03
21464  44 1642  1465            STRAL*LBUF+355D
21465  34 0664  1466            JP*L5S
21466  00 0000  1467            0*0
21467  00 0000  1470            0*0
21470  12 4112  1471    DL14    ENTAL*TEMP
21471  61 1501  1472            JPALZ*DL14NT
21472  12 4113  1473            ENTAL*TEMP+1
21473  44 1640  1474            STRAL*LBUF+353D
21474  12 4114  1475            ENTAL*TEMP+2
21475  44 1641  1476            STRAL*LBUF+354D
21476  12 4115  1477            ENTAL*TEMP+3
21477  44 1642  1500            STRAL*LBUF+355D
21500  40 4112  1501            CL*TEMP
21501  12 0457  1502    DL14NT  ENTAL*GEM2E-15
21502  44 1777  1503            STRAL*LBUF+448D
21503  12 0456  1504            ENTAL*GEM2E-16
21504  44 1526  1505            STRAL*LBUF+279D
21505  12 0455  1506            ENTAL*GEM2E-17
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21506  44 1174  1507            STRAL*LBUF+061D
21507  12 0000  1510    DL14AD  ENTAL*0
21510  02 4047  1511            CMAL*T369D
21511  61 1516  1512            JPEQ*LOK+5
21512  02 4050  1513            CMAL*T370D
21513  61 1516  1514            JPEQ*LOK+3
21514  02 4051  1515            CMAL*T371D
21515  63 1520  1516            JPNOT*LOK+3
21516  76 2256  1517            RJP*TEMPR2
21517  34 1526  1520            JP*LOK+7
21520  12 0473  1521            ENTAL*GEM2E-01
21521  44 1660  1522            STRAL*LBUF+369D
21522  12 0472  1523            ENTAL*GEM2E-02
21523  44 1661  1524            STRAL*LBUF+370D
21524  12 0471  1525            ENTAL*GEM2E-03
21525  44 1662  1526            STRAL*LBUF+371D
21526  34 0763  1527            JP*L6S
21527  00 0000  1530            0*0
21530  00 0000  1531            0*0
21531  12 4112  1532    DL15    ENTAL*TEMP
21532  61 1542  1533            JPALZ*DL15NT
21533  12 4113  1534            ENTAL*TEMP+1
21534  44 1660  1535            STRAL*LBUF+369D
21535  12 4114  1536            ENTAL*TEMP+2
21536  44 1661  1537            STRAL*LBUF+370D
21537  12 4115  1540            ENTAL*TEMP+3
21540  44 1662  1541            STRAL*LBUF+371D
21541  40 4112  1542            CL*TEMP
21542  12 0357  1543    DL15NT  ENTAL*GEM1E-15
21543  44 2001  1544            STRAL*LBUF+450D
21544  12 0356  1545            ENTAL*GEM1E-16
21545  44 1527  1546            STRAL*LBUF+280D
21546  12 0355  1547            ENTAL*GEM1E-17
21547  44 1523  1550            STRAL*LBUF+276D
21550  12 0000  1551    DL15AD  ENTAL*0
21551  02 4052  1552            CMAL*T378D
21552  61 1557  1553            JPEQ*LOK+5
21553  02 4053  1554            CMAL*T379D
21554  61 1557  1555            JPEQ*LOK+3
21555  02 4054  1556            CMAL*T380D
21556  63 1561  1557            JPNOT*LOK+3
21557  76 2243  1560            RJP*TEMPR1
21560  34 1567  1561            JP*LOK+7
21561  12 0373  1562            ENTAL*GEM1E-01
21562  44 1671  1563            STRAL*LBUF+378D
21563  12 0372  1564            ENTAL*GEM1E-02
21564  44 1672  1565            STRAL*LBUF+379D
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21565  12 0371  1566          ENTAL*GEM1E-03
21566  44 1673  1567          STRAL*LBUF+380D
21567  34 1063  1570          JP*L7S
21570  00 0000  1571          0*0
21571  00 0000  1572          0*0
21572  12 4112  1573  DL16    ENTAL*TEMP
21573  61 1603  1574          JPALZ*DL16NT
21574  12 4113  1575          ENTAL*TEMP+1
21575  44 1671  1576          STRAL*LBUF+378D
21576  12 4114  1577          ENTAL*TEMP+2
21577  44 1672  1600          STRAL*LBUF+379D
21600  12 4115  1601          ENTAL*TEMP+3
21601  44 1673  1602          STRAL*LBUF+380D
21602  40 4112  1603          CL*TEMP
21603  12 0457  1604  DL16NT  ENTAL*GEM2E-15
21604  44 2002  1605          STRAL*LBUF+451D
21605  12 0456  1606          ENTAL*GEM2E-16
21606  44 1533  1607          STRAL*LBUF+284D
21607  12 0455  1610          ENTAL*GEM2E-17
21610  44 1524  1611          STRAL*LBUF+277D
21611  12 0000  1612  DL16AD  ENTAL*0
21612  02 4055  1613          CMAL*T394D
21613  61 1620  1614          JPEQ*LOK+5
21614  02 4056  1615          CMAL*T395D
21615  61 1620  1616          JPEQ*LOK+3
21616  02 4057  1617          CMAL*T396D
21617  63 1622  1620          JPNOT*LOK+3
21620  76 2256  1621          RJP*TEMPR2
21621  34 1630  1622          JP*LOK+7
21622  12 0473  1623          ENTAL*GEM2E-01
21623  44 1711  1624          STRAL*LBUF+394D
21624  12 0472  1625          ENTAL*GEM2E-02
21625  44 1712  1626          STRAL*LBUF+395D
21626  12 0471  1627          ENTAL*GEM2E-03
21627  44 1713  1630          STRAL*LBUF+396D
21630  34 1162  1631          JP*L8S
21631  00 0000  1632          0*0
21632  00 0000  1633          0*0
21633  12 4112  1634  DL17    ENTAL*TEMP
21634  61 1644  1635          JPALZ*DL17NT
21635  12 4113  1636          ENTAL*TEMP+1
21636  44 1711  1637          STRAL*LBUF+394D
21637  12 4114  1640          ENTAL*TEMP+2
21640  44 1712  1641          STRAL*LBUF+395D
21641  12 4115  1642          ENTAL*TEMP+3
21642  44 1713  1643          STRAL*LBUF+396D
21643  40 4112  1644          CL*TEMP
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21644  12 0357  1645    DL17NT  ENTAL*GEM1E-15
21645  44 2003  1646            STRAL*LBUF+452D
21646  12 0356  1647            ENTAL*GEM1E-16
21647  44 1535  1650            STRAL*LBUF+286D
21650  12 0355  1651            ENTAL*GEM1E-17
21651  44 1525  1652            STRAL*LBUF+278D
21652  12 0000  1653    DL17AD  ENTAL*0
21653  02 4060  1654            CMAL*T403D
21654  61 1661  1655            JPEQ*LOK+5
21655  02 4061  1656            CMAL*T404D
21656  61 1661  1657            JPEQ*LOK+3
21657  02 4062  1660            CMAL*T405D
21660  63 1663  1661            JPNOT*LOK+3
21661  76 2243  1662            RJP*TEMPR1
21662  34 1671  1663            JP*LOK+7
21663  12 0373  1664            ENTAL*GEM1E-01
21664  44 1722  1665            STRAL*LBUF+403D
21665  12 0372  1666            ENTAL*GEM1E-02
21666  44 1723  1667            STRAL*LBUF+404D
21667  12 0371  1670            ENTAL*GEM1E-03
21670  44 1724  1671            STRAL*LBUF+405D
21671  34 0133  1672            JP*L1S
21672  00 0000  1673            0*0
21673  00 0000  1674            0*0
21674  12 4112  1675    DL18    ENTAL*TEMP
21675  61 1705  1676            JPALZ*DL18NT
21676  12 4113  1677            ENTAL*TEMP+1
21677  44 1722  1700            STRAL*LBUF+403D
21700  12 4114  1701            ENTAL*TEMP+2
21701  44 1723  1702            STRAL*LBUF+404D
21702  12 4115  1703            ENTAL*TEMP+3
21703  44 1724  1704            STRAL*LBUF+405D
21704  40 4112  1705            CL*TEMP
21705  12 0457  1706    DL18NT  ENTAL*GEM2E-15
21706  44 2012  1707            STRAL*LBUF+459D
21707  12 0456  1710            ENTAL*GEM2E-16
21710  44 1556  1711            STRAL*LBUF+303D
21711  12 0455  1712            ENTAL*GEM2E-17
21712  44 1543  1713            STRAL*LBUF+292D
21713  12 0000  1714    DL18AD  ENTAL*0
21714  02 4063  1715            CMAL*T419D
21715  61 1722  1716            JPEQ*LOK+5
21716  02 4064  1717            CMAL*T420D
21717  61 1722  1720            JPEQ*LOK+3
21720  02 4065  1721            CMAL*T421D
21721  63 1724  1722            JPNOT*LOK+3
21722  76 2256  1723            RJP*TEMPR2
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21723  34 1732  1724            JP*L0K+7
21724  12 0473  1725            ENTAL*GEM2E-01
21725  44 1742  1726            STRAL*LBUF+419D
21726  12 0472  1727            ENTAL*GEM2E-02
21727  44 1743  1730            STRAL*LBUF+420D
21730  12 0471  1731            ENTAL*GEM2E-03
21731  44 1744  1732            STRAL*LBUF+421D
21732  34 0271  1733            JP*L2S
21733  00 0000  1734            0*0
21734  00 0000  1735            0*0
21735  12 4112  1736  DL19      ENTAL*TEMP
21736  61 1746  1737            JPALZ*DL19NT
21737  12 4113  1740            ENTAL*TEMP+1
21740  44 1742  1741            STRAL*LBUF+419D
21741  12 4114  1742            ENTAL*TEMP+2
21742  44 1743  1743            STRAL*LBUF+420D
21743  12 4115  1744            ENTAL*TEMP+3
21744  44 1744  1745            STRAL*LBUF+421D
21745  40 4112  1746            CL*TEMP
21746  12 0357  1747  DL19NT    ENTAL*GEM1E-15
21747  44 2013  1750            STRAL*LBUF+460D
21750  12 0356  1751            ENTAL*GEM1E-16
21751  44 1555  1752            STRAL*LBUF+302D
21752  12 0355  1753            ENTAL*GEM1E-17
21753  44 1545  1754            STRAL*LBUF+294D
21754  12 0000  1755  DL19AD    ENTAL*0
21755  02 4066  1756            CMAL*T428D
21756  61 1763  1757            JPEQ*L0K+5
21757  02 4067  1760            CMAL*T429D
21760  61 1763  1761            JPEQ*L0K+3
21761  02 4070  1762            CMAL*T430D
21762  63 1765  1763            JPNOT*L0K+3
21763  76 2243  1764            RJP*TEMPR1
21764  34 1773  1765            JP*L0K+7
21765  12 0373  1766            ENTAL*GEM1E-01
21766  44 1753  1767            STRAL*LBUF+428D
21767  12 0372  1770            ENTAL*GEM1E-02
21770  44 1754  1771            STRAL*LBUF+429D
21771  12 0371  1772            ENTAL*GEM1E-03
21772  44 1755  1773            STRAL*LBUF+430D
21773  34 0355  1774            JP*L3S
21774  00 0000  1775            0*0
21775  00 0000  1776            0*0
21776  12 4112  1777  DL20      ENTAL*TEMP
21777  61 2007  2000            JPALZ*DL20NT
22000  12 4113  2001            ENTAL*TEMP+1
22001  44 1753  2002            STRAL*LBUF+428D
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22002  12 4114  2003          ENTAL*TEMP+2
22003  44 1754  2004          STRAL*LBUF+429D
22004  12 4115  2005          ENTAL*TEMP+3
22005  44 1755  2006          STRAL*LBUF+430D
22006  40 4112  2007          CL*TEMP
22007  12 0457  2010  DL20NT  ENTAL*GEM2E-15
22010  44 2016  2011          STRAL*LBUF+463D
22011  12 0456  2012          ENTAL*GEM2E-16
22012  44 2014  2013          STRAL*LBUF+461D
22013  12 0455  2014          ENTAL*GEM2E-17
22014  44 1554  2015          STRAL*LBUF+301D
22015  12 0000  2016  DL20AD  ENTAL*0
22016  02 4071  2017          CMAL*T444D
22017  61 2024  2020          JPEQ*L0K+5
22020  02 4072  2021          CMAL*T445D
22021  61 2024  2022          JPEQ*L0K+3
22022  02 4073  2023          CMAL*T446D
22023  63 2026  2024          JPNOT*L0K+3
22024  76 2256  2025          RJP*TEMPR2
22025  34 2034  2026          JP*L0K+7
22026  12 0473  2027          ENTAL*GEM2E-01
22027  44 1773  2030          STRAL*LBUF+444D
22030  12 0472  2031          ENTAL*GEM2E-02
22031  44 1774  2032          STRAL*LBUF+445D
22032  12 0471  2033          ENTAL*GEM2E-03
22033  44 1775  2034          STRAL*LBUF+446D
22034  34 0443  2035          JP*L4S
22035  00 0000  2036          0*0
22036  00 0000  2037          0*0
22037  12 4112  2040  DL21    ENTAL*TEMP
22040  61 2050  2041          JPALZ*DL21NT
22041  12 4113  2042          ENTAL*TEMP+1
22042  44 1773  2043          STRAL*LBUF+444D
22043  12 4114  2044          ENTAL*TEMP+2
22044  44 1774  2045          STRAL*LBUF+445D
22045  12 4115  2046          ENTAL*TEMP+3
22046  44 1775  2047          STRAL*LBUF+446D
22047  40 4112  2050          CL*TEMP
22050  12 0357  2051  DL21NT  ENTAL*GEM1E-15
22051  44 2020  2052          STRAL*LBUF+465D
22052  12 0356  2053          ENTAL*GEM1E-16
22053  44 2017  2054          STRAL*LBUF+464D
22054  12 0355  2055          ENTAL*GEM1E-17
22055  44 1546  2056          STRAL*LBUF+295D
22056  12 0000  2057  DL21AD  ENTAL*0
22057  02 4074  2060          CMAL*T453D
22060  61 2065  2061          JPEQ*L0K+5
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22061  02 4075  2062          CMAL*T454D
22062  61 2065  2063          JPEQ*L0K+3
22063  02 4076  2064          CMAL*T455D
22064  63 2067  2065          JPNOT*L0K+3
22065  76 2243  2066          RJP*TEMPR1
22066  34 2075  2067          JP*L0K+7
22067  12 0373  2070          ENTAL*GEM1E-01
22070  44 2004  2071          STRAL*LBUF+453D
22071  12 0372  2072          ENTAL*GEM1E-02
22072  44 2005  2073          STRAL*LBUF+454D
22073  12 0371  2074          ENTAL*GEM1E-03
22074  44 2006  2075          STRAL*LBUF+455D
22075  34 0664  2076          JP*L5S
22076  00 0000  2077          0*0
22077  00 0000  2100          0*0
22100  12 4112  2101  DL22    ENTAL*TEMP
22101  61 2111  2102          JPALZ*DL22NT
22102  12 4113  2103          ENTAL*TEMP+1
22103  44 2004  2104          STRAL*LBUF+453D
22104  12 4114  2105          ENTAL*TEMP+2
22105  44 2005  2106          STRAL*LBUF+454D
22106  12 4115  2107          ENTAL*TEMP+3
22107  44 2006  2110          STRAL*LBUF+455D
22110  40 4112  2111          CL*TEMP
22111  12 0457  2112  DL22NT  ENTAL*GEM2E-15
22112  44 2021  2113          STRAL*LBUF+466D
22113  12 0456  2114          ENTAL*GEM2E-16
22114  44 1133  2115          STRAL*LBUF+028D
22115  12 0455  2116          ENTAL*GEM2E-17
22116  44 1572  2117          STRAL*LBUF+315D
22117  12 0000  2120  DL22AD  ENTAL*0
22120  02 4077  2121          CMAL*T469D
22121  61 2126  2122          JPEQ*L0K+5
22122  02 4100  2123          CMAL*T470D
22123  61 2126  2124          JPEQ*L0K+3
22124  02 4101  2125          CMAL*T471D
22125  63 2130  2126          JPNOT*L0K+3
22126  76 2256  2127          RJP*TEMPR2
22127  34 2136  2130          JP*L0K+7
22130  12 0473  2131          ENTAL*GEM2E-01
22131  44 2024  2132          STRAL*LBUF+469D
22132  12 0472  2133          ENTAL*GEM2E-02
22133  44 2025  2134          STRAL*LBUF+470D
22134  12 0471  2135          ENTAL*GEM2E-03
22135  44 2026  2136          STRAL*LBUF+471D
22136  34 0763  2137          JP*L6S
22137  00 0000  2140          0*0
```

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22140  00 0000  2141          0*0
22141  12 4112  2142  DL23    ENTAL*TEMP
22142  61 2152  2143          JPALZ*DL23NT
22143  12 4113  2144          ENTAL*TEMP+1
22144  44 2024  2145          STRAL*LBUF+469D
22145  12 4114  2146          ENTAL*TEMP+2
22146  44 2025  2147          STRAL*LBUF+470D
22147  12 4115  2150          ENTAL*TEMP+3
22150  44 2026  2151          STRAL*LBUF+471D
22151  40 4112  2152          CL*TEMP
22152  12 0357  2153  DL23NT  ENTAL*GEM1E-15
22153  44 2022  2154          STRAL*LBUF+467D
22154  12 0356  2155          ENTAL*GEM1E-16
22155  44 1170  2156          STRAL*LBUF+057D
22156  12 0355  2157          ENTAL*GEM1E-17
22157  44 1547  2160          STRAL*LBUF+296D
22160  12 0000  2161  DL23AD  ENTAL*0
22161  02 4102  2162          CMAL*T478D
22162  61 2167  2163          JPEQ*L0K+5
22163  02 4103  2164          CMAL*T479D
22164  61 2167  2165          JPEQ*L0K+3
22165  02 4104  2166          CMAL*T480D
22166  63 2171  2167          JPNOT*L0K+3
22167  76 2243  2170          RJP*TEMPR1
22170  34 2177  2171          JP*L0K+7
22171  12 0373  2172          ENTAL*GEM1E-01
22172  44 2035  2173          STRAL*LBUF+478D
22173  12 0372  2174          ENTAL*GEM1E-02
22174  44 2036  2175          STRAL*LBUF+479D
22175  12 0371  2176          ENTAL*GEM1E-03
22176  44 2037  2177          STRAL*LBUF+480D
22177  34 1063  2200          JP*L7S
22200  00 0000  2201          0*0
22201  00 0000  2202          0*0
22202  12 4112  2203  DL24    ENTAL*TEMP
22203  61 2213  2204          JPALZ*DL24NT
22204  12 4113  2205          ENTAL*TEMP+1
22205  44 2035  2206          STRAL*LBUF+478D
22206  12 4114  2207          ENTAL*TEMP+2
22207  44 2036  2210          STRAL*LBUF+479D
22210  12 4115  2211          ENTAL*TEMP+3
22211  44 2037  2212          STRAL*LBUF+480D
22212  40 4112  2213          CL*TEMP
22213  12 0457  2214  DL24NT  ENTAL*GEM2E-15
22214  44 2032  2215          STRAL*LBUF+475D
22215  12 0456  2216          ENTAL*GEM2E-16
22216  44 2027  2217          STRAL*LBUF+472D
```

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22217  12 0455  2220          ENTAL*GEM2E-17
22220  44 1164  2221          STRAL*LBUF+053D
22221  12 0000  2222  DL24AD  ENTAL*0
22222  02 4105  2223          CMAL*T494D
22223  61 2230  2224          JPEQ*LOK+5
22224  02 4106  2225          CMAL*T495D
22225  61 2230  2226          JPEQ*LOK+3
22226  02 4107  2227          CMAL*T496D
22227  63 2232  2230          JPNOT*LOK+3
22230  76 2256  2231          RJP*TEMPR2
22231  34 2240  2232          JP*LOK+7
22232  12 0473  2233          ENTAL*GEM2E-01
22233  44 2055  2234          STRAL*LBUF+494D
22234  12 0472  2235          ENTAL*GEM2E-02
22235  44 2056  2236          STRAL*LBUF+495D
22236  12 0471  2237          ENTAL*GEM2E-03
22237  44 2057  2240          STRAL*LBUF+496D
22240  34 1162  2241          JP*L8S
22241  00 0000  2242          0*0
22242  00 0000  2243          0*0
22243  00 0000  2244  TEMPR1  0*0
22244  12 0371  2245          ENTAL*GEM1E-3
22245  44 4115  2246          STRAL*TEMP+3
22246  12 0372  2247          ENTAL*GEM1E-2
22247  44 4114  2250          STRAL*TEMP+2
22250  12 0373  2251          ENTAL*GEM1E-1
22251  44 4113  2252          STRAL*TEMP+1
22252  70 0001  2253          ENTALK*1
22253  44 4112  2254          STRAL*TEMP
22254  50 3000  2255          RIL*0
22255  55 2243  2256          IJP*TEMPR1
22256  00 0000  2257  TEMPR2  0*0
22257  12 0471  2260          ENTAL*GEM2E-3
22260  44 4115  2261          STRAL*TEMP+3
22261  12 0472  2262          ENTAL*GEM2E-2
22262  44 4114  2263          STRAL*TEMP+2
22263  12 0473  2264          ENTAL*GEM2E-1
22264  44 4113  2265          STRAL*TEMP+1
22265  70 0001  2266          ENTALK*1
22266  44 4112  2267          STRAL*TEMP
22267  50 3000  2270          RIL*0
22270  00 0000  2271          0*0
```